A COMPARISON OF MOVIE AND MULTIPLE-IMAGE PRESENTATION TECHNIQUES ON AFFECTIVE AND COGNITIVE LEARNING

Thesis for the Degree of Ph. D.

MICHIGAN STATE UNIVERSITY

LAWRENCE L. ATHERTON

1971

This is to certify that the

thesis entitled

A COMPARISON OF MOVIE AND MULTIPLE-IMAGE PRESENTATION TECHNIQUES ON AFFECTIVE AND COGNITIVE LEARNING

presented by

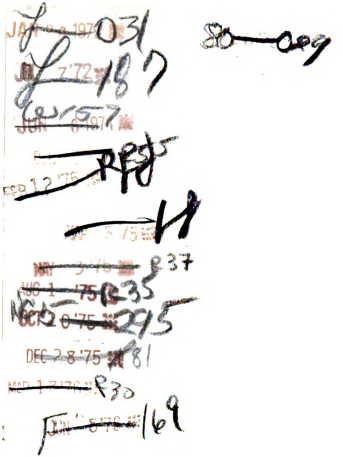
Lawrence L. Atherton

has been accepted towards fulfillment
of the requirements for

Ph.D. degree in Education

Major professor

Date May 5, 1971



ABSTRACT

A COMPARISON OF MOVIE AND MULTIPLE-IMAGE PRESENTATION TECHNIQUES ON AFFECTIVE AND COGNITIVE LEARNING

By

Lawrence L. Atherton

The purpose of this study was to determine if a multiple-image slide and audio presentation would result in greater affective and cognitive learning than similar content presented by a 16mm sound film. Since the audio portion of both presentations was reproduced from the same 12 minute master tape recording, neither audio nor length of presentation was considered variables. Both presentations were photographed in color from the same artwork.

The population for the experiment consisted of 46 graduate students enrolled in a media course at Michigan State University. These students were randomly assigned to one of two treatment groups. A repeated measures design was utilized with affective gain and cognitive performance scores comprising the dependent variables. The independent variable was multiple-image presentation and film presentation.

The stimulus materials used for the experiment consisted of a story about the development of instruction at

a university in a mythical kingdom. The events in the story were such that individual versus team efforts in developing instruction formed a continuum on which attitudinal change could be measured.

The multiple-image and 16mm presentations were experienced simultaneously by the two experimental groups in separate classrooms. The 16mm film was shown on a screen 8 feet wide. The multiple-image slide presentation was shown on three screens placed side-by-side, each of which was 8 feet wide. All slide changes were synchronized to the audio tape by a multiple-channel programming unit.

To measure attitude change, two Guttman scales were constructed and tested in a pilot study. The statements used in the scales each contained 5 response categories. The results of the pilot study indicated that the scales were unidimensional and equivalent. One form of the scale was used as the pretest for each treatment group with the second form being used as the posttest.

A posttest-only cognitive measure was used to avoid the possibility of the pretest acting as an advanced organizer for the subjects.

Guttman Scalogram Analysis was again used to analyze the results of the attitudinal scales used in the experiment and the unidimensionality of the scales was established.

Two univariate analyses of variance were utilized in determining the significance of the results. The first

analysis compared the gain scores in affective learning for the two treatment groups. The second analysis compared the posttest scores in cognitive learning. Directional hypotheses were tested at the .05 level.

The analysis of the results supports the following conclusions:

1. In comparing the relative effectiveness of multiple-image slide and audio presentation with a 16mm sound film, no significant difference was found in the amount of attitudinal change elicited as a result of the presentation mode.

2. No significant difference was found between treatment groups relative to the amount of cognitive learning resulting from receiving the presentations.[1]

3. Analyses of variance for affective and cognitive learning irrespective of treatment yielded significance at the .05 level. These analyses indicate that while one treatment was not significantly more effective than the other, both treatments were effective in producing positive increases in affective and cognitive learning.

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[1]Although not statistically significant, a comparison of the mean scores indicated a slightly greater gain in affective learning with the multiple-image presentation, while the 16mm film presentation resulted in slightly greater cognitive learning.

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A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

College of Education

1971

ACKNOWLEDGMENTS

Merely listing the names of people who have been so helpful to me in conducting this research falls woefully short of expressing the sincere appreciation that is felt. It is hoped that these people will somehow understand the gratitude that cannot be adequately expressed.

To my doctoral committee: Dr. Paul W. F. Witt, Chairman, Dr. Dale Alam, Dr. Norman Bell, and Dr. James Page.

To Dr. Raymond Gorden for his valuable assistance in constructing and testing the Guttman scales used in the study.

To Dr. Maryellen McSweeney for her help in designing the study and analyzing the data.

To Dr. Curt McCarty, a friend who never doubted and who supplied needed encouragement.

To my fellow graduate students who were so instrumental in the education I received during my study at Michigan State University.

And especially to my wife, Marty, and to Jeff and Barbara for their faith, support, and understanding.

L.L.A.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

THE PROBLEM

Purpose of the Study

The purpose of this study is to determine whether there are differences in affective and/or cognitive learning as a result of experiencing two different forms of mediated presentation, i.e., a multiple-image slide and audio presentation and a 16mm sound film presentation. Since the audio portion of both presentations will be duplications of the same 12 minute master tape recording, both audio and length of presentation will be considered constants rather than variables.

This study will specifically test the following hypotheses:

1. A multiple-image slide presentation will result in a greater gain in affective learning relative to the content of the presentation than will a corresponding 16mm film presentation.

2. A multiple-image slide presentation will result in greater cognitive learning relative to the content of the presentation than will a corresponding 16mm film presentation.

Need for the Study

Multiple-image presentation is increasing in popularity and is included in that category generally

referred to as newer media. In a landmark study, Perrin explored the history of multiple-image presentations and found that while experimentation extended back to the end of the previous century, public knowledge and enthusiasm were not heightened until the latter part of the 1960's when the technique was used in several international expositions.[1]

While the use of multiple-image techniques has proven to be popular in the entertainment and promotional fields, its potential uses as an effective communication tool for learning remain largely hypothetical. The Association for Educational Communications and Technology[2] provided several rooms for demonstrations of multiple-image presentations at its national conventions in 1969 and 1970. Productions shown there were, in the main, member-produced and the interest that was generated on the part of educators is largely responsible for the rescheduling of this function each year.[3]

A number of articles have appeared in various professional journals and popular magazines with the general

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[1]Donald G. Perrin, "A History and Analysis of Simultaneous Projected Images in Educational Communication" (unpublished Ph.D. dissertation, University of Southern California, 1969).

[2]Formerly the Department of Audiovisual Instruction (DAVI).

[3]The multiple image presentation used in the present study was first shown at the DAVI convention in Detroit in April, 1970.

tone of the articles indicating a belief that multiple-image communication can be an effective tool for learning. In Education and Ecstasy, Leonard described a modern school operating in 2001 A. D. in which a Basics Dome was featured employing multiple-images formed by holograms and supplemented with stereo sound. While cognitive learning was in progress, the affective component of learning was very much in evidence throughout the story.

> There is a pause as the cat image gradually fades and the purring mingles with sweeping electronic music coming from the display on the left. As the dialogue goes on there between boy and CAD in the lovely visual symbols of calculus, a spinning wheel fills most of the display. Through its spokes, slender and glistening like the spokes of a bicycle wheel, may be viewed the rush of its motion - across grassy fields, deserts, down winding mountain roads. A ghostly image of the wheel appears on Sally's display too, along with multicolored, dancing wave forms, related somehow to her brain waves.[4]

Technologically, the school described by Leonard is becoming increasingly possible. Multiple-image projection, holograms, electronic music, stereo sound, the display of brain wave patterns and computerized instructional systems are all prevalent today, although each exists in various stages of development. There is little research evidence, however, on the effect of some of the newer media forms on the learner.

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[4]George B. Leonard, Education and Ecstasy (New York: Dell Publishing Company, 1968), p. 151.

In discussing problems related to research in instructional media, Briggs states that a situation exists in which:

> . . . media research has not provided the basis for development of an improved rationale upon which could be based a better way of deciding upon the media in which various materials are to be made available.[5]

Perrin, in analyzing and synthesizing the present status of multiple-image presentations, indicated a basic need for, ". . . a theoretical basis for design, production, and utilization."[6] It would appear from a review of the literature since Perrin's study was published that little research has been conducted to assist the educator in choosing when and how to use multiple-image techniques most effectively.

Lumsdaine supported the need for research in instructional media, stating that:

> . . . in terms of likely payoff, higher priority can justifiably be accorded to research on the controllable properties of instructional media than to similar research on abstract methods or procedures of instruction.[7]

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[5]Leslie J. Briggs, et al., Instructional Media: A Procedure for the Design of Multi-Media Instruction, A Critical Review of Research, and Suggestions for Future Research (Monograph No. 2) (Pittsburgh, Pa.: American Institutes for Research, 1967), p. 2.

[6]Perrin, op. cit., p. 3.

[7]A. A. Lumsdaine, "Instruments and Media of Instruction," in Handbook of Research on Teaching, ed. by N. L. Gage (Chicago: Rand McNally & Co., 1963), p. 587.

While many comparative studies have been conducted relative to mediated instruction, the studies have often involved the comparison of a particular form of mediated presentation with what is often referred to as conventional classroom techniques. The fact that such studies often involve a highly variable component, the human element, has led many educators to discount the often contradictory findings of this type of comparative research. Campeau, in reviewing the literature on film research, found that a large portion of the studies made comparisons of film teaching and face-to-face teaching for a variety of subject matters, ages, and special situations. She noted that, "Comparative studies which pit films against a medium other than face-to-face instruction are very scarce."[8]

In the affective domain, few studies have been conducted to measure the amount of learning attributable to the use of a specific medium in instruction. Fewer still exist comparing affective learning between two forms of mediated instruction and when one of the forms is multiple-image, research is almost nonexistent.

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[8]Peggie L. Campeau, "Selective Review of Literature on Audiovisual Media of Instruction," in Instructional Media: A Procedure for the Design of Multi-Media Instruction, A Critical Review of Research, and Suggestions for Future Research (Monograph No. 2), edited by Leslie J. Briggs, et al. (Pittsburgh, Pa.: American Institutes for Research, 1967), p. 111.

There are factors which complicate research in the affective domain. First, not as much research has been conducted in the affective domain as in the cognitive domain, particularly in relation to instructional media. The resultant vacuum has been filled with opinion, but this does not provide an established body of knowledge from which significant variables can be extracted for further experimentation. Secondly, the construction of instruments for measuring affective learning is difficult. Of particular concern is the necessity of ascertaining that the affective instrument is measuring one variable only, a task more easily alluded to than accomplished. These problems combined with the newness of the multiple-image technique, have not served to stimulate an overabundance of research in the affective domain.

The growing interest in multiple-image presentation would seem to suggest that additional research needs to be conducted to determine the relative effectiveness of multiple-image presentation in affective and cognitive learning as compared to other forms of mediated instruction which are available to the educator.

Definitions

Specific terms used in this study are defined as follows:

Multiple-image

> 1. The image which results from projecting two or more separate but related pictures simultaneously. With large screens or adjacent screens it is also possible for separate images to combine into a continuous panorama. 2. Two or more related images projected adjacent to each other.[9]

Instructional Development

A systematic process in which an instructor, as content specialist, is joined by other specialists who then act as a team to solve instructional problems. Other specialists might include an educational psychologist, evaluation specialist, media specialists and/or others as required by the problem.

Cognitive Domain

That which deals with, ". . . the recall or recognition of knowledge and the development of intellectual abilities and skills."[10] The major classes within the cognitive domain include (1) Knowledge, (2) Comprehension, (3) Application, (4) Analysis, (5) Syntheses, and (6) Evaluation.[11]

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[9]Perrin, op. cit., p. 205.

[10]Benjamin S. Bloom, ed., Taxonomy of Educational Objectives, Handbook 1: Cognitive Domain (New York: David McKay Company, 1956), p. 7.

[11]Ibid., p. 18.

Affective Domain

That which deals with, ". . . changes in interest, attitudes, and values, and the development of appreciations and adequate adjustment."[12] The major classes within the affective domain include, (1) Receiving, (2) Responding, (3) Valuing, (4) Organization, and (5) Characterization by a Value Complex.[13]

Attitude

> . . . the degree of positive or negative affect associated with some "psychological object." Psychological object is simply a generic term for any concept, issue, institution, ideal, person or group toward which individuals may have positive or negative feelings.[14]

Attitude Scale

> . . . a quantitative method for assessing an individual's relative position along a unidimensional attitude continuum. The direction and intensity of the respondent's attitude are indicated by a single score which summarizes his responses to a series of items, each of which is related to the single concept, object, or issue under study.[15]

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[12] Ibid., p. 7.

[13] David R. Krathwohl, Benjamin S. Bloom, and Bertram B. Masia, Taxonomy of Educational Objectives, Handbook II: Affective Domain (New York: David McKay Company, 1964), p. 37.

[14] Allen L. Edwards, and Bette C. Porter, "Attitude Measurement," in The Affective Domain: A Resource Book for Media Specialists (Washington, D.C.: Communication Service Corporation, 1970), p. 117.

[15] Ibid., p. 123.

Guttman Scale

The Guttman scale, sometimes called the cumulative scale,

> . . . consists of a relatively small set of homogeneous items that are unidimensional. A unidimensional scale measures one variable, and one variable only. The scale gets its name from the cumulative relation between items and the total scores of individuals.[16]

Theory and Rationale

This study is concerned with the relative amount of affective and cognitive learning elicited by two differing forms of mediated presentation, a multiple-image slide presentation and a 16mm film presentation. In this section, some of the theoretical dimensions of two aspects of the study will be explored, i.e., multiple-image presentations and attitudinal measurement by Guttman Scalogram Analysis.

Multiple-image Theory

Perrin has reviewed and summarized much of the research in multiple-image communication in an effort to formulate a basic theory. He reports that there is general agreement about the parameters of multiple-image communication.

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[16]Fred N. Kerlinger, Foundations of Behavioral Research (New York: Holt, Rinehart and Winston, Inc., 1964), p. 485.

> From the existing body of knowledge there appear to be three major factors which distinguish multiple-image communication from conventional use of media. These are: (1) simultaneous images, (2) screen size, and (3) information density.[17]

The importance of each of these three factors is explained as follows:

> Media such as films, television, filmstrips and slides have, until now, presented their images sequentially. In sequential montage the meaning of each new image is determined by the context of what has gone before. In its temporal aspects, sequential montage is analogous to verbal language, where several elements in series determine the total meaning. Simultaneous images interact upon each other at the same time, and this is of significant value in making comparisons and relationships. An important contributing factor is screen size. On small screens, the overall identity of the image is most significant. On large screens, (or screens side-by-side) the viewer makes his own montage of different image elements, increasing the probability of learning comparative information. The immediacy of this kind of communication allows the viewer to process larger amounts of information in a very short time. Thus information density is effectively increased, and certain kinds of information are more efficiently learned.[18]

While it is apparent that many variables may be operating within each of the three major factors listed by Perrin, his contributions of these parameters of multiple-image communication is noteworthy. From this point, empirical research can proceed to determine if multiple-image communication is effective in each of the domains of learning and what the key variables are that determine the relative effectiveness of the technique.

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[17] Perrin, op. cit., p. 89.

[18] Ibid., p. 90.

Joel speculates that the use of multiple-images results primarily in affective learning.

> Multiple pictures make audiences understand more through feeling than through thinking. Pictures are thrown at the spectators with or without words, stories are told without logical sequence; viewers are deliberately thrown off-balance mentally and even physically.[19]

From a learning standpoint, Trohanis indicates that multiple-image techniques operate in both the affective and cognitive domains.

> As a vehicle for intensifying environmental learning, this activity embraces two levels of learning involvement. The first concerns members of the audience who gain knowledge and feelings of a topic from their participatory viewing and listening.[20]

The multiple-image presentation utilized in this study involves the three major factors as outlined by Perrin. The presentation is basically linear, consisting of a satire on instructional development which is aimed primarily at the affective domain. Cognitive elements are present in the story which will allow that domain to be tested as well. All of the slides are photographs of specially produced artwork and are utilized in a variety of presentational patterns, i.e., three-screen panoramas, two-screen panoramas with associated images on the third

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[19]Yale Joel, "A Film Revolution to Blitz Man's Mind at Expo 67," Life, July 14, 1967, p. 25.

[20]Pascal Trohanis, "Environmental Ecological Education via Simultaneously Projected Multiple-Images with Sound," Audiovisual Instruction (January, 1971), 20.

screen, and three independent and independently-changing images related to the development of a single concept. All of the slide changes are synchronized with the sound track through a multiple-channel programming unit which allows the program to be presented repeatedly in the established format.

Guttman Scalogram Analysis

There are several methods for measuring attitude and attitude shift. Those which are used more frequently include Thurstone scales, Likert scales, Guttman scales and Osgood's semantic differential. Each method has particular strengths and weaknesses, but all attempts at attitudinal measurement share one common problem which is the determination that only a single variable is being measured. Guttman states:

> One of the fundamental problems facing research workers in the field of attitude and public opinion measurement is to determine if the questions asked on a given issue have a single meaning for the respondents. Obviously, if a question means different things to different respondents, then there is no way that the respondents can be ranked in order of favorableness.[21]

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[21]Louis Guttman, "The Basis for Scalogram Analysis," reprinted from Studies of Social Psychology in World War II, Volume 4 of Measurement and Prediction, Princeton University Press, 1949. Bobbs-Merrill Reprint Series in the Social Sciences, Print No. S-413, p. 60.

When all of the questions on a scale do have a single meaning for the respondents, the scale is said to be unidimensional or to measure a single variable.

One of the principal reasons for selecting Guttman Scalogram Analysis for this study is the favorable probability of producing unidimensionality in the constructed attitudinal scale. This characteristic of Guttman scales is supported by Shaw who indicates that:

> . . . these scales are more likely to be unidimensional than scales constructed by other procedures. The scalogram method usually yields scales that are reliable and valid according to the usual estimates of these attributes.[22]

Defining a Guttman scale is particularly difficult since it is more of a process of evaluating a previously constructed scale than a technique for constructing the scale. After a number of attitudinal statements have been constructed and administered to the population of interest (or a sample of that population), Guttman Scalogram Analysis will determine whether or not the attitude statements form a proper scale and if they are unidimensional.

> In practice, scalogram analysis can perhaps be most accurately described as a procedure for evaluating sets of statements or existing scales to determine whether or not they meet the

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[22]Marvin E. Shaw and Jack M. Wright, Scales for the Measurement of Attitudes (New York: McGraw-Hill Book Company, 1967), p. 26.

> requirements of a particular kind of scale, set forth in some detail by Guttman.[23]

In writing items for a Guttman scale, the items must not only appear to be unidimensional, but must include items which extend to opposite extremes which might be representative of a given respondent's attitude. Edwards further suggests that:

> . . . an important test for each statement is whether or not one can expect subjects with varying attitudes toward the psychological object to respond differentially to the statements. If it can be inferred that an 'agree' (or disagree) response will be given by subjects with more favorable attitudes and a 'disagree' (or agree) response by subjects with less favorable attitudes, then a statement may be judged satisfactory.[24]

The statements that are constructed for a particular scale should be ranked as to scale position a priori to insure that statements reflecting a continuum have been constructed. The final scaling of individual statements will, however, be determined by scalogram analysis after the attitudinal instrument has been administered and scored.

A Guttman scale is often referred to as a cumulative scale. Oppenheim has written a useful analogy for illustrating the cumulative nature of this type of scale.

> The items in a Guttman scale have the properties of being ordinal and cumulative. For instance: lead, glass, and diamond are ordered according to

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[23] Allen L. Edwards, Techniques of Attitude Scale Construction (New York: Appleton-Century-Crofts, Inc., 1965), p. 172.

[24] Ibid., p. 178.

> their cumulative degree of hardness; addition, multiplication and the extraction of square roots are arithmetical operations ordered according to their cumulative degree of difficulty (it is highly likely that anyone who can multiply can also add and that anyone who can extract square roots can both add and multiply). If we think of a dozen or more degrees of hardness or difficulty, ranked in order, then many respondents will endorse the early ones - indicating that they know how to add, subtract, multiply, and so on - but sooner or later, they will 'cross over' and fail to endorse such remaining items as solving differential equations or carrying out integrations. This cross-over point is their individual score. From it, we know precisely which items they must have endorsed.[25]

Each response is scored by assigning it a number with the higher number reflecting a more positive attitude toward the psychological object. For example, a dichotomous item to which a person could only respond with a "yes" or "no" might result in a "yes" being scored as 1 and a "no" being scored as 0. This would be the case only if the "yes" answer reflected a more positive attitude. If the "no" answer reflected the more positive attitude, it would be scored as 1 with the "yes" being scored as 0. Similarly, a trichotomous item with different response choices might find "agree" being scored as 2, "undecided" being scored as 1, and "disagree" being scored as 0 (again, assuming that the "agree" choice reflected the more positive attitude). It is a common practice for all of the

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[25]A. N. Oppenheim, Questionnaire Design and Attitude Measurement (New York: Basic Books, Inc., 1966), p. 144.

items in a given scale to have the same number of response choices although it is not a necessity.

After the scores are totaled for each individual, the people are ranked from high to low. If a true scale exists:

> . . . a person with a more favorable attitude score than another person must also be just as favorable or more favorable in his response to every statement in the set than the other person. When responses to a set of attitude statements meet this requirement, the set of statements is said to constitute a unidimensional scale.[26]

Guttman favors the ranking of people rather than items. In ranking items only, he feels that the ranking is limited to a dichotomous response pattern with the respondent either endorsing or failing to endorse a given attitudinal statement. In ranking people, Guttman sees an advantage since this:

> . . . provides a more general approach to the problem of scaling, since it turns out to be equivalent to the ranking of items when all items are dichotomous, and it also includes the case where items have more than two answer categories.[27]

Guttman has stated that, "Perfect scales are not to be expected in practice."[28] He suggests a measure of how close a scale is to perfection by calculating what he refers to as the coefficient of reproducibility.

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[26]Edwards, op. cit., p. 172.

[27]Guttman, op. cit., p. 62.

[28]Ibid., p. 64.

> It is secured by counting up the number of responses which would have been predicted wrongly for each person on the basis of his scale score, dividing these errors by the total number of responses and subtracting the resulting fraction from 1.[29]

To put this into a simplified formula where "R" stands for the coefficient of reproducibility:

$$R = 1 - \frac{\text{number of errors}}{\text{number of responses}}$$

For example, assume that an attitudinal instrument contains 10 statements which are responded to by 20 people. The total number of responses would be 200. If there were a total of 30 scaling errors, the coefficient of reproducibility would be calculated to be:

$$R = 1 - \frac{30}{200} = 1 - .15 = .85$$

This figure of .85 reproducibility is the point most often mentioned in the literature on Guttman scales as the base for scalability. The figure is usually related to the coefficient of reproducibility for dichotomous items, however, and the use of higher numbers of response choices may involve some flexibility in interpreting scalability.

To insure that a high coefficient of reproducibility is not spurious, Guttman suggests that in establishing

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[29] Ibid., p. 77.

the cutting points at which a response pattern shifts, no resultant category of response should contain more error than non-error. Torgerson additionally suggests that:

> While it is desirable to have a considerable range of marginals, items with extreme marginals tend to make the value of Rep [reproducibility] spuriously high. Hence, few, if any, items should have more than 80 per cent of the subjects in their most popular category.[30]

When the number of choices that a respondent has to an item increases above the dichotomous level, the sensitivity of the instrument likewise increases.

> For example, four dichotomous items with high reproducibility do not provide as dependable an inference concerning the scalability of an area as would four trichotomous items which were equally as reproducible.[31]

In other words, the greater the number of response categories, the more precise is the test for unidimensionality since there is a greater chance of error appearing when there are more categories.

> If a relatively large number of response categories are used, say five, then one will usually find that the discrepancies between the predicted patterns of response and those actually observed are so great that the number of errors in quite large, resulting in a value of less than .85 for the coefficient of reproducibility. When this is the case, Guttman suggests that a second score matrix be constructed. Where the recorded weights in a given column of the original score matrix appear

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[30]Warren S. Torgerson, Theory and Methods of Scaling (New York: John Wiley & Sons, Inc., 1958), p. 324.

[31]Guttman, op. cit., p. 80.

> to overlap considerably, then the categories of response assigned these weights may be combined.[32]

This process of combining categories is usually referred to as collapsing. If, for example, analysis of a completed attitudinal instrument indicated that on one of the statements the respondents fluctuated back and forth between "agree" and "strongly agree," these two categories could then be collapsed into a single category. New weights would then be assigned to the category, papers rescored and a new ranking of individuals would probably result. Hopefully, the scalability of the test would increase with a resultant increase in the coefficient of reproducibility. The necessity for collapsing two categories could simply be the result of trying to measure an attitude more precisely than was possible for the respondents relative to that particular statement.

It is usually desirable to conduct a pretest of a Guttman scale to ascertain that an attitude does, in fact, exist relative to the psychological object being measured and that a unidimensional scale with acceptable reproducibility exists within the constructed statements.

> In practice, ten or more items can be used on a pretest to determine whether or not a universe is scalable but fewer items can be used in the larger study - if the universe is shown to be scalable by

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[32]Edwards, op. cit., p. 190.

> the pretest - to obtain the number of ranks necessary for the amount of discrimination between people required by the study.[33]

Attitudinal scales are sometimes constructed and used without a pretest, but this should be done only when considerable experience in constructing such scales is present on the part of the researcher and the psychological object being measured is one in which attitudes encompassing a wide range have a high probability of existing within the respondents.

Oppenheim has concisely summarized both the weakness and the strength of Guttman Scalogram Analysis.

> His procedures are laborious, and there is no certainty that, in the end, a usable scale will result. On the other hand, scalogram analysis will prevent us from building a single scale for a universe of content that really demands two or more separate scales; in other words, it offers the important safeguard of unidimensionality.[34]

Limitations of the Study

There are specific limitations to this study which must be considered in facilitating a correct interpretation of the findings.

The results of this study will be generalizable to other populations only to the extent that other populations are similar in characteristics to the population used in the experiment and only in relation to the specific

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[33] Guttman, op. cit., p. 79.

[34] Oppenheim, op. cit., p. 150.

presentations used. This generalizability aspect of the study is in agreement with commonly accepted research principles.

This study will concern itself only with the broader issues of affective and cognitive learning comparisons between two forms of mediated presentation, i.e., a multiple-image slide presentation and a 16mm film presentation. Further, the multiple-image presentation form is restricted to a three-screen configuration with the screens forming a wide panorama. Other variables of interest, such as the number and placement of screens, distance of the viewer from the screens, use of flashing images and analysis of information density are beyond the scope of this study. The reader is additionally cautioned against applying the findings of the study to all multiple-image presentations or inferring a similar relationship between all multiple-image and film presentations.

CHAPTER II

REVIEW OF THE LITERATURE

This chapter presents a review of the literature related to cognitive and affective learning that results from experiencing the two mediums which constitute the variables of interest in this study, i.e., film presentations and multiple-image presentations.

Film Studies

In one of the more penetrating summaries of film research, Hoban states:

> Film research to date has been a feast of investigation in factual learning, in attitude change, and in perceptual-motor learning . . .[1]

In this section, film studies will be reviewed which demonstrate that, (1) films are an effective medium for cognitive learning, and (2) films have a significant impact on affective learning. Specific film studies which are closely related to this study will then be reviewed.

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[1]Charles F. Hoban, "The Usable Residue of Educational Film Research," in New Teaching Aids for the American Classroom, ed. by Wilbur Schramm (Stanford, California: Institute for Communication Research, Stanford University, 1960), p. 103.

While many empirical studies of film and its use in education have been conducted, it remains a difficult area for research.

> The creative nature of film-making increases the difficulty of film research, since (a) independent variables are embedded in an art form, and (b) the art of film-making itself is a variable. In the creative process, the artist, knowingly or unknowingly, may introduce additional variables which have not yet been identified as variables in theory or research. Consequently, there is a concensus rather than an invariance in film research findings supporting the relatively certain policies of knowledge, in that 'pure' research in educational films is practically impossible.[2]

In summarizing film research, Hoban utilizes four criteria of confidence:

1. Reasonable intuition
2. Demonstrated competence of the investigator as an imaginative observer
3. Relatability to a consensus of theoretical formulation
4. Replication of the investigation of the problem.[3]

Utilizing these four criteria of confidence in his summary of film research, he concludes:

> . . . the evidence that factual, attitudinal, opinional [sic], and perceptual-motor learning occurs when people are exposed to films is overwhelming. On the basis of satisfaction of all four criteria of confidence, it can safely be said that people learn from films.[4]

In a review of research in educational media, Allen also concludes that films can be effective in both

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[2] Ibid., p. 104.

[3] Ibid., p. 97.

[4] Ibid., p. 105.

attitudinal and cognitive learning. He summarizes research in the cognitive domain by observing that:

> Motion pictures can teach factual information content at least as effectively as conventional classroom techniques over a wide range of subject matter content, age ranges, abilities, and conditions of use. In about 85 percent of the studies comparing motion picture teaching with conventional methods, films were found to be significantly superior in these typical instructional situations.[5]

He similarly supports the ability of films to effect attitudinal change.

> There is evidence that motion pictures, television, and radio will have an influence on attitudes, opinions, and motivations if they stimulate or reinforce existing beliefs of the audience.[6]

The majority of film research has been directed at cognitive learning. This is particularly true of earlier studies. An exception is the study by Thurstone as reported by Edwards and Porter.

> Media presentations in themselves represent an important means of influencing attitude learning, or implementing attitude change in the larger social context. That media presentations may be used effectively to influence change in children's attitudes has been shown in a number of research studies. Thurstone (1933) investigated the effects of a number of motion pictures on the attitudes of children. The children's attitudes were first measured, then they were shown a film chosen to influence their attitudes toward nationality, race, war, crime, or the punishment of criminals. Attitudes were again measured, either the day after the film was shown, or several weeks or

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[5]William H. Allen, "Research in New Educational Media: Summary and Problems," Audio-Visual Communication Review, VI (Spring, 1959), 85.

[6]Ibid.

> months following exposure. The results consistently showed that the films had a significant effect on the children's attitudes toward social issues.[7]

A study by Merrill is of interest since it involved the use of a professionally constructed film designed to improve viewer attitudes toward traffic safety.[8] In commenting on the construction of attitude films, Merrill states that:

> . . . the attitude film is a compromise. In it, stimuli which arouse a general state of emotion are substituted for 'pure' manipulation. Along with these stimuli the film presents propositions to influence beliefs. However, since more running time is needed to arouse emotion, an attitude film can present fewer propositions of cognitive belief than an information film of equivalent length.[9]

In conducting the research, Merrill used an attitude film, an information film, and a control film not related to traffic safety. The division of the three major groups into subgroups based on the cognitive component of their attitude, saliency of belief, and degree of rigidity in their thinking resulted in a total of 12 groups. Merrill's findings were as follows:

> Hypothesis I was supported: The initial affect of the attitude film is manipulation of the cognitive component of attitude. Attitude films do not communicate 'pure' affect.

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[7] Edwards and Porter, op. cit., p. 116.

[8] Irving R. Merrill, "Attitude Films and Attitude Change," Audio-Visual Communication Review, X (January-February, 1962), 3-13.

[9] Ibid., p. 6.

> Hypothesis II was supported: Defensive avoidance occurs when strong fears are aroused by the attitude film through its dramatic form. Too little of the film's running time remains to make the proposed course of action reassuring enough to overcome the fears.
>
> Hypothesis III was not supported: There was not more cognitive change in flexible thinkers than in rigid ones after they viewed an information film. For viewers of the attitude film, no differences between rigid and flexible thinkers on measures of saliency, cognitive change, and affect were predicted, and none were found.[10]

In reviewing the literature, no studies were found which directly compared film presentation with multiple-image presentation. A number of studies have compared film with single-image slide presentation. Allen and Weintraub compared film and single-image slide presentations in teaching specific facts in science and social studies.[11] They found a significant difference in favor of film presentation but reported that, "There appeared to be no relationships between the sex or mental ability of the subjects and their performance under different experimental conditions."[12] Allen and Weintraub infer from their findings that:

> The overriding conclusion that can be drawn from the study is that the motion picture mode is more effective no matter what the content of the

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[10] Ibid., p. 13.

[11] William H. Allen and Royd Weinbraub, The Motion Variables in Film Presentations, ERIC ED027750 (Final Report), University of Southern California, 1968.

[12] Ibid., p. 63.

> material, the instructional objectives being served, or the characteristics of the learners.[13]

A study by Miller is particularly pertinent to this experiment since he (a) compared film to a still projected image, (b) studied attitudinal change, and (c) used a unique method of measurement for attitudinal shift. Miller hypothesized that:

> . . . film motion would, of itself, create audience emotional involvement response as measured by GSR [galvanic skin response] and that this would produce positive audience attitude response, but would not be a factor in information recall.[14]

Galvanic skin response was measured through the cooperation of a local hospital. For his research, Miller used a film in which motion played an important role. From this film he extracted specific frames to create a filmograph.

> A filmograph is a series of still frames on motion picture film each printed repeatedly a predetermined number of times so that the time each still scene appears in the film is controlled by the normal speed of projection.[15]

In addition to measuring emotional involvement by galvanic skin response, a 5-point Likert scale was administered after the film was presented and a semantic differential

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[13] Ibid., p. 64.

[14] William C. Miller, III, "Film Movement and Affective Response and the Effect on Learning and Attitude Formation," AV Communication Review, XVII (Summer, 1969), 173.

[15] Ibid.

pretest and posttest were utilized. The results of Miller's study indicated that emotional involvement was not a factor in the recall of information. The study did not, however, produce a significant difference between the filmograph version and the regular film version relative to a basic attitude change. Miller concludes:

> Motion, then, may be an aesthetic property salient in film and capable of being used in that medium to produce emotional involvement response, but this response must be considered in part a function of all other response-producing properties of a film. Motion probably functions as one factor within an interdependent nexus of many response-producing factors.[16]

In a study conducted at Purdue University, film and slide formats were compared to determine if there were differing abilities between these mediums to present a concept in which motion was important as opposed to a non-motion concept.

> It was hypothesized that the use of motion picture film would facilitate the learning of a concept involving motion as a defining attribute. It was also hypothesized that there would be no differences in learning between a motion picture and a slide presentation in the learning of a nonmotion concept.[17]

Prior experience with the concept was avoided by constructing irregular geometric shapes. These were photographed

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[16] Ibid., p. 179.

[17] Ronald L. Houser, Eileen J. Houser, and Adrian P. Van Mondfrans, "Learning a Motion and a Nonmotion Concept by Motion Picture versus Slide Presentation," AV Communication Review, XVIII (Winter, 1970), 426.

on 8mm film and on slides for single-image projection. Motion involved a 90 degree rotation of the geometric figure.

The results of the study indicated that the motion picture presentation resulted in an increased ability of the subjects to identify a geometric shape that was associated with the concept of motion. For nonmotion concepts, the motion picture presentation also resulted in increased learning over the slide presentation, but this was discounted by the researchers as the result of paired associate learning and the finding was not considered to be necessarily valid. This study is noteworthy in relation to the present study since motion is limited in the film to be used and is not considered a necessary attribute for the cognitive and affective learning which is to be measured.

In presenting instruction in which motion is not an important aspect of the learning, Lumsdaine indicates that:

> . . . reproducible, carefully planned instruction, as represented by film and its television cousins, can be valuable even where the visual material is largely static. Similar instruction can often be provided by a sound-accompanied series of still pictures requiring simpler equipment and less expensive materials.[18]

It would appear, then, that the literature supports the conclusion that films can effect both cognitive

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[18]Lumsdaine, op. cit., p. 589.

learning and attitudinal change. The reader desiring more detail on film research is directed to Hoban and van Ormer,[19] Allen,[20] Hoban,[21] Lumsdaine,[22] and Campeau.[23]

Multiple-image Studies

The literature in multiple-image presentation is marked by opinion and speculation, but a scarcity of research. Although many of the articles appear to support the potential uses of the technique, the medium is not without its detractors.

An early study by Allen and Cooney found the multiple-image technique to be more effective than single-image in teaching sixth grade students, but not when used with eighth grade students.[24] They concluded that the method of presentation has less effect on students as they grow older. They further state:

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[19]Charles F. Hoban and Edward B. van Ormer, Instructional Film Research, 1918-1950, Technical Report No. SDC 269-7-19, Instruction Film Program, Pennsylvania State College. Port Washington, L. I., Special Devices Center December, 1950.

[20]Allen, op. cit.

[21]Hoban, op. cit.

[22]Lumsdaine, op. cit.

[23]Campeau, op. cit.

[24]William H. Allen and Stuart M. Cooney, A Study of the Non-Linearity Variable in Filmic Presentation, Final Report NDEA Title VII Project No. 422, ERIC No. ED003563 (Los Angeles: University of Southern California, 1963).

> The results of this study imply that, contrary to the recent revolutionary interests in multi-imagery . . . there is really little cause for excitement.[25]

Twyford indicates that there may be reasons other than the simultaneous projection of adjacent images which causes an increase in learning.

> Multi-media presentations which present two or more pictures on several screens simultaneously with synchronized commentary have recently become popular. These impressive multisensory presentations may not be the reason for the increased learning that a few studies have demonstrated. The careful organization and presentation of instructional content may make the greatest contribution to increased learning.[26]

Conversely, Kappler, in a popular magazine, supports the viewpoint that the greatest use of multiple-image techniques may be in education rather than in entertainment, and that it is precisely the simultaneous projection of several images that is the underlying basis for increased learning.

> But in education lie the most exciting possibilities. Some of the possibilities are direct and simple - the multiple picture, for example. One picture, seen by itself, impresses a fact on the mind. Two or three seen together, and often with continuously changing juxtaposition, conjure up a complexity of ideas and relations in which the whole is more than the sum of the parts.[27]

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[25] Ibid., p. 108.

[26] Loran C. Twyford, Jr., "Educational Communications Media," in Encyclopedia of Educational Research, ed. by Robert L. Ebel, et al. (4th ed.; New York: The Macmillan Company, 1969), p. 372.

[27] Frank Kappler, "The Mixed Media - Communication that Puzzles, Excites and Involves," Life, July 14, 1967, p. 28c.

Kappler also speculates that the multiple-image technique operates in the affective domain and questions its possibilities for effectiveness in cognitive learning.

> It certainly drives hardest at sensations and emotions. Could it be that this revolutionary bombarding of the senses can create only attitudes, not philosophies? Can it convey only generalizations (apartheid is hateful, peace would be nice, it's great to be young), not hard facts?[28]

This question is particularly interesting since it has yet to be empirically demonstrated that multiple-image presentations can be effective in shaping attitudes.

Even prior to Expo 67 and the early research by Allen and Cooney, educators were already using multiple-image communication for cognitive learning. Perrin states:

> There are unconfirmed reports that other art departments in this period began using two slide projectors side by side to compare paintings on a similar theme by different artists, and different works of the same artist. Certainly Teachers College, Columbia University was using this in the mid fifties, and the author observed Dr. Scott at the University of Southern California teaching many of his art classes with two screen techniques in 1959.[29]

Perrin further indicates growing usage of the technique during the sixties, citing uses by South Connecticut State College in geography, the use of over 200 automated programs by the University of Wisconsin, and the Monterey

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[28] Ibid.

[29] Perrin, op. cit., p. 67.

Pennisula College utilization of multiple-images in 20 subject areas ranging from physics to art appreciation.[30]

At the University of Wisconsin in 1961, a multiple-screen installation was permanently established utilizing five slide projectors.[31] A single large rear-projection screen was used to display multiple-images in various configurations. Eventually a 16mm projector, 3 1/4" X 4" projector and overhead projectors were also utilized. A theory of learning by pattern was seen as a possible explanation for the increased learning claimed for the technique.

> The three-part screen enables us to capitalize on the Gestalt theory of learning . . . learning by configuration or pattern rather than by isolated elements. While one image is on the main screen illustrating the professor's remarks, others can be shown simultaneously on the other two. Perhaps the phenomenon of subliminal learning, learning unconsciously, may also come from this multi-screen presentation.[32]

In commenting on the effectiveness of the presentation mode, Hubbard states:

> Professor Fowlkes points out that a tape lecture of 50 minutes can be boiled down to 20 telemation minutes with no loss of material or loss of learning by students.[33]

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[30] Ibid., pp. 76-78.

[31] Richard D. Hubbard, "Telemation: AV Automatically Controlled," Audiovisual Instruction (November, 1961), 437-439.

[32] Ibid., p. 439.

[33] Ibid.

It is not stated whether these findings are the result of empirical research or informal analysis. The absence of data on research procedures in the article would tend to suggest the latter.

An empirical study by Lombard was conducted to compare the effectiveness of a three-screen multiple-image presentation with a single-image presentation of materials in history.[34] The materials used consisted of text book illustrations, graphs, charts, cartoons, and similar material. The study indicated a significant difference in favor of the multiple-screen approach, but only for girls. Lombard indicates that the results are not to be considered necessarily valid because of basic problems encountered in the experiment.

A study by Olson measured gain in cognitive and motor skills with high school sophomores in medical self-help.[35] Students were assigned to one of four different treatment groups, (a) audio, (b) audio and 57 slides, (c) audio and film, or (d) audio, film and 303 slides. Each presentation was for a period of 53 minutes. Olson found no significant difference in cognitive learning between

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[34]Emanuel S. Lombard, "Multi-Channel, Multi-Image Teaching of Synthesis Skills in Eleventh Grade United States History" (unpublished Ph.D. dissertation, University of Southern California, 1969).

[35]John R. Olson, "The Effect of Multi-Stimuli Presentations on Learning Gain," Dissertation Abstracts, 30:2425-A, 1969.

treatment groups, but motor skill learning did increase with an increase in media stimulation. Olson concludes:

> When a multitude of related stimuli are present, the student seems able to select those portions which are useful to him and reject those which are not.[36]

Only one empirical study was found which attempted to measure attitudinal shift as a result of multiple-image presentation. Bollman sought to answer two basic questions:

1. Will a multi-image and audio presentation cause greater positive shift in evaluative meaning than a parallel single-image and audio presentation?

2. Is the magnitude of shift in evaluative meaning related to the amount of the viewer's visual field which is covered by the projected image area as determined by the viewer's distance from the screen?[37]

The multiple-image presentation consisted of three slide projectors programmed onto three ten-foot screens placed side-by-side. The subject of the presentation was Biochemistry at Michigan State University. Bollman drew his sample from two graduate classes in the College of Education. To measure the shift in evaluative meaning, a semantic differential attitude scale was constructed and pretested.

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[36] Ibid., p. 2425a.

[37] Charles G. Bollman, "The Effect of Large-Screen, Multi-Image Display on Evaluative Meaning" (unpublished Ph.D. dissertation, Michigan State University, 1970), p. 80.

The study yielded no significant difference related either to the multi-screen presentation compared with the single-image presentation, or to the location of the viewer in the multi-screen presentation. Bollman concluded from further analysis of the data that there was evidence that a systematic main effect was operating, but that some of the concepts tested were not discrete and the semantic differential instrument he used was not unidimensional.

Summary

Literature on film research revealed a large number of empirical studies demonstrating the capability of the medium to effect attitudinal change and contribute to cognitive learning. Many of the studies, however, compared film with conventional classroom techniques which include a highly variable component, the human element. Those studies which did compare film with other mediums usually used single-image slides. No studies were found which compared film to multiple-image presentation.

Few empirical studies have been conducted in multiple-image presentation modes. As a result, the literature generally reflects speculation rather than established fact. Opinions tend to support the capability of the medium to operate in both affective and cognitive learning. The small amount of empirical research available often compared multiple-image slide presentation with

single-image slide presentation. Significant increases in cognitive learning have been found, but the overall results are somewhat contradictory. Only one prior study was found which attempted to measure additudinal change as a result of subjects receiving a multiple-image presentation. The results of the study were inconclusive due to the use of an attitudinal scale which was not unidimensional.

CHAPTER III

DESIGN OF THE STUDY

Introduction

The primary purpose of this study was to investigate the comparative effect of multiple-image and film presentation on affective and cognitive learning. In this chapter, the determination of the population, the nature of the stimulus material and the experimental design are presented. Following this, the research hypotheses are stated and the method used for statistical analysis is reported.

The Population

Since the audience for whom the stimulus materials were designed is limited, there was no opportunity for using true sampling procedures and making the study generalizable to a larger population. The stimulus materials had been originally produced for presentation to graduate students and/or faculties involved in the process of instructional development. The experimental population selected consisted of 58 students enrolled in the Education 831a course in educational media taught during the winter term of 1971 at Michigan State University. The class met at night and the students were either enrolled full-time in

graduate study or working in educational professions during the day and studying part-time at night.

Using the class roster, each student's name was typed on a 3" X 5" card. The cards were then used to assign the students randomly to one of two experimental treatments. The room number to which the student was assigned was written on the cards which were checked and collected by a monitor at the door of each of the two classrooms as verification that the students were in the treatment group to which they had been randomly assigned. Due to a blizzard on the day of the experiment, only 46 of the 58 students were present. After being given their cards with the room assignments, they divided equally into two experimental groups of 23 students each.

Stimulus Materials

The content of both the multiple-image and film presentations consisted of a satire on interpersonal relationship problems in the instructional development process (see Appendix A). The story is in the form of a fairy tale which takes place in a mythical kingdom in which a king has established a university for his people. A young professor develops an idea which he feels will improve his instruction and he seeks help from an instructional development team to get the idea into practice. As he works with various specialists, his idea (which is represented by a

geometric abstraction) becomes modified until, at the end of the story, it bears little resemblance to the original idea. The story does not identify the professor's subject area and no inferences are made as to whether or not the original idea was basically good or if it needed modification.

When viewed out of context by educators who are not directly involved in the process of instructional development, the presentation generally evokes negative reactions toward team approaches to the development of instruction. The content of the presentation is useful, therefore, for comparing two mediums relative to the extent of the resultant attitudinal shift.

As stated previously, the audio portion of both the multiple-image and film presentations was duplicated from the same master tape which was 12 minutes in length. Neither audio nor length of presentation constituted variables in the experiment.

Original artwork was created in a variety of aspect ratios for the multiple-image presentation. The artwork was then photographed on 35mm color film to produce slides. A variety of presentational patterns were utilized, including three-screen panoramas, two-screen panoramas with the geometric abstraction evolving on the third screen, and three independent and independently-changing images related to the development of a single concept.

The original artwork was again used to photograph the 16mm film version of the story. Where the multiple-image presentation used a panorama, the 16mm film version panned across the artwork to give the same information, but in a sequential form rather than all at once. The film also utilized dissolves and quick cuts, but no animation of the characters was possible because of time and budgetary considerations.

Presentation Format

Both the multiple-image and 16mm film presentations were shown in regular university classrooms, each with a seating capacity of approximately 50 students. One of the rooms was rectangular while the other room approximated a square. The 16mm film was shown in the rectangular room with the image projected lengthwise onto a screen that was 8 feet wide.

The multiple-image presentation employed three screens, each of which was 8 feet wide for a total screen width of 24 feet (see Figure 1). Two slide projectors were used for each screen and were interconnected with a dissolve unit which faded one picture out as the other picture faded in. The use of dissolves was considered important to the presentation since this technique permitted the geometric abstraction on the screen to evolve rather than change abruptly. All slide changes were controlled by a

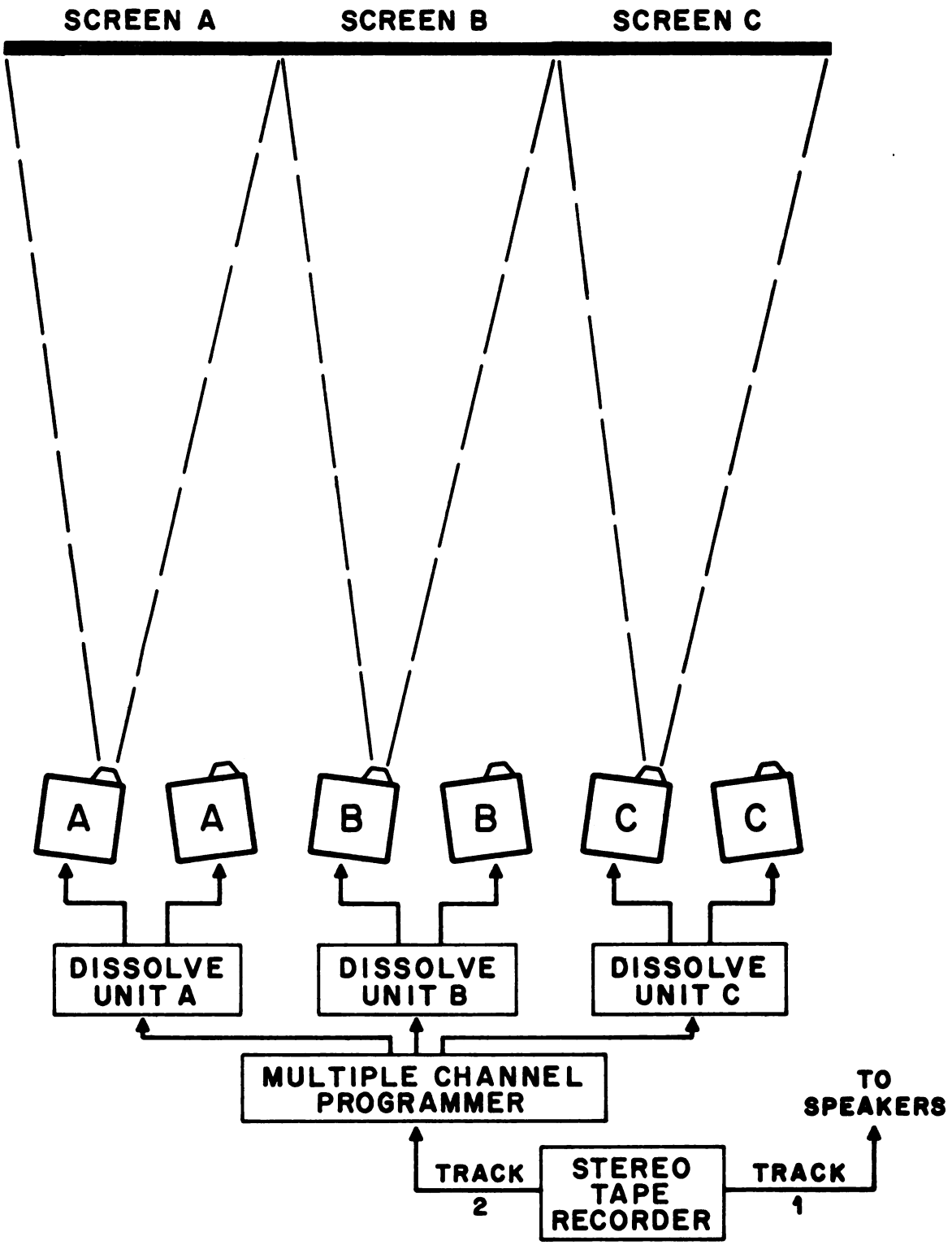

Figure 1.--Multiple-image Presentation.

multiple channel programmer synchronized with the audio portion of the presentation.

Instrumentation

Affective Measure

Attitudinal shift for treatment groups was measured by a Guttman scale created specifically for this study. Approximately 60 attitudinal statements were written on a continuum from an extreme position of favorableness toward team efforts in the development of instruction to the opposite extreme favoring individual efforts. Eleven of these statements were selected for a pilot study to validate the instrument.[1] Each statement contained 5 possible responses ranging from "strongly agree" to "strongly disagree." From these 11 statements, a second group of 11 statements was constructed by revising the sentence structure and/or shifting the positive or negative emphasis of the original statements. The order in which the statements appeared on each of the forms was determined by random assignment. These two forms were then combined and renumbered to form a 22-item scale. This form was used as the pretest while a second randomized version served as the posttest (see Appendix B). A direction sheet was constructed to minimize extraneous verbal contaminants. A second sheet contained

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[1]The writing and selection of attitudinal statements was supervised by Dr. Rayomnd L. Gorden, Director of Cross-cultural Research, Antioch College, Yellow Springs, Ohio.

a brief description of the concept of instructional development, as used in the presentation, to insure that those subjects not familiar with the term could relate it to the attitude statements and the content of the presentation.

The population for the pilot study consisted of 20 teachers who volunteered to see a movie related to the development of instruction. They were not informed in advance that they were part of a pilot study. These teachers were employed by the Yellow Springs School District (Ohio) and virtually all either had graduate degrees or were working toward them. This population was selected since, of the populations available for the pilot study, it was closest in characteristics to the population to be used in the study.

The pretest was administered, followed by the presentation of the film version used in this study and the posttest immediately thereafter. The posttest was then separated into the two forms which had previously been combined, with statements 1-11 comprising Form 1 and statements 12-22 comprising Form 2. These two forms were then scored and analyzed using Guttman Scalogram Analysis to determine if a unidimensional scale existed within the 11 statements on each form. On both forms, 8 of the 11 statements were found to be scalable. No collapsing of response categories was necessary on these 8 items. As indicated in Table 1, the coefficients of reproducibility

TABLE 1.--Results of pilot test for validating equivalency of two Guttman scales.

	Guttman Form 1	Guttman Form 2
number of subjects	20	20
items that scaled (11 given)	8	8
coefficient of reproducibility	.87	.88
score range	12 to 35	15 to 34
mean	25.4	26.0
standard deviation	5.6	4.9
Spearman rank correlation	.926	

for Form 1 and Form 2 were .87 and .88 respectively. The mean, standard deviation and range of scores were also compared for the two forms. A Spearman rank correlation was used to compare the two forms with a positive correlation of .926 resulting.

The instrument was judged independently by two qualified researchers as being valid for measuring attitude toward the concept of individual versus team efforts in the development of instruction.[2] Each had seen the film

[2]Dr. Raymond L. Gorden, Director of Cross-cultural Research, Antioch College, Yellow Springs, Ohio, and Dr. Maryellen McSweeney, Counseling and Personnel Services and Educational Psychology, Michigan State University, East Lansing, Michigan.

version of the presentation at least once. Each agreed that on the basis of the data, the two forms could be characterized as being separate but equivalent forms.

For the experimental study, the affective instrument was modified as a result of information gained in the pilot study. Both forms of the attitudinal scale were comprised of only those 8 items which scaled on the pilot study (see Appendix C). The middle response position for each statement was changed from "don't know" to "undecided" to lessen any pressure the subject might feel to select an alternative to that position.

A discussion with the respondents following the pilot study revealed that three teachers had not viewed the presentation as a team effort since their experience with teams was comprised of all members of the team meeting at once (in the presentation, the content specialist works individually with members of the instructional development team). The brief discussion of the instructional development process which was attached to the attitudinal scale was modified for the experiment to remedy that problem.

Cognitive Measure

The amount of cognitive learning was measured by a short-answer test based on the recall of specific information contained in the presentation. For the pilot study, 8 questions were constructed and attached to the posttest following the affective measure (see Appendix B).

The questions were designed to measure information available only as a result of receiving the presentation. The absence of the pretest avoided the problem of the pretest acting as an advanced organizer for the subjects, i.e., alerting them to the specific cognitive information to look for in the presentation.

Question 1 on the pilot study was not scored, but was included for informational purposes. Analysis of the pilot study results indicated that question 5 was subjective and open to various interpretations. The remaining questions were judged by the two independent researchers previously mentioned as being valid for measuring cognitive recall information contained in the presentation. For the experimental study, then, the identical questions were used as contained in the pilot study except for the omission of questions 1 and 5 (see Appendix C).

Experimental Design

The design used for this study was a modification of Campbell and Stanley's Pretest-Posttest Control Group Design.[3] Figure 2 illustrates the modified design that was utilized.

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[3]Donald T. Campbell and Julian C. Stanley, "Experimental and Quasi-experimental Designs for Research on Teaching," in Handbook of Research on Teaching, ed. by N. L. Gage (Chicago: Rand McNally & Co., 1963), pp. 171-246.

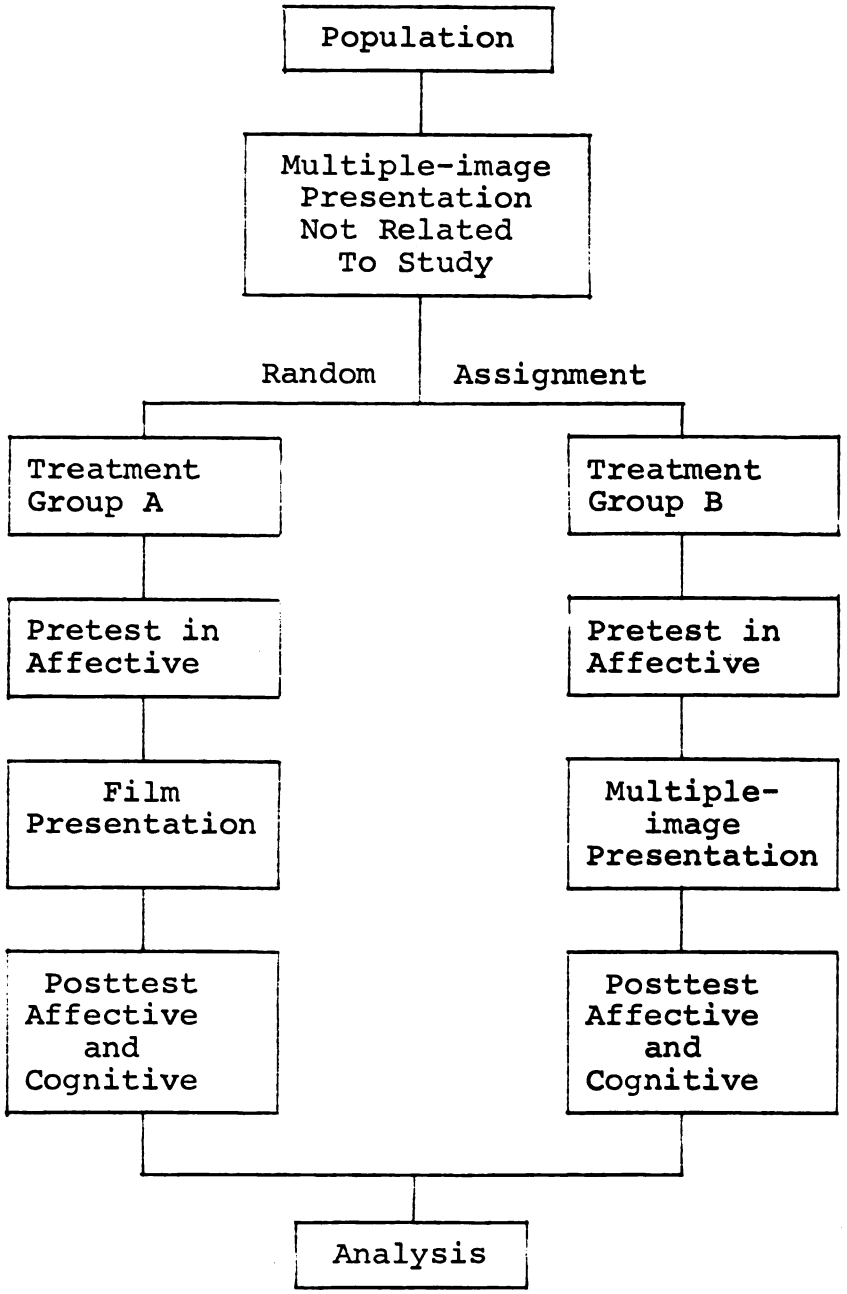

Figure 2.--Design of the study.

One week prior to the experiment, a multiple-image presentation was shown to the entire class from which the two treatment groups were drawn. This multiple-image presentation was not related to the content of the experiment (the subject was art). Although several presentations would have been preferable, the single presentation was all that could be arranged to negate the novelty effect of the multiple-image presentation technique prior to the experiment.

Two forms of a Guttman scale which had been pretested for equivalency were administered as the pretest and posttest for the affective measure. A single cognitive measure was utilized as a posttest.

No control group was used since extraneous variables were controlled by the design of the study. The affective measure, as mentioned previously, consisted of two forms which had been pretested for equivalency. The posttest-only cognitive measure did not permit learning from the pretest. The effect of time was not a factor since the experimental measures and treatments were within a 45 minute segment. Intertreatment group contamination was avoided by conducting both experimental treatments and measures simultaneously in separate classrooms. Verbal influences by proctors were also minimized by the use of printed instructions on both the pretest and the posttest.

Hypotheses

The following hypotheses were generated and tested to compare the relative effectiveness of multiple-image and film presentation in affective and cognitive learning.

Null Hypothesis 1a: There will be no difference in the amount of attitudinal learning relative to presentation content between subjects receiving the multiple-image presentation and subjects receiving the film presentation.

Alternate Hypothesis 1a: Those subjects receiving the multiple-image presentation will show greater attitudinal learning relative to presentation content than will the subjects receiving the film presentation.

Null Hypothesis 2a: There will be no difference in the amount of cognitive learning relative to presentation content between subjects receiving the multiple-image presentation and subjects receiving the film presentation.

Alternate Hypothesis 2a: Those subjects receiving the multiple-image presentation will show greater cognitive learning relative to presentation content than will the subjects receiving the film presentation.

Analysis

A repeated measures design was used with affective and cognitive gain scores comprising the dependent variables for each of the two treatment groups. The multiple-image presentation and film presentation formed the independent variables.

The pretest and posttest attitudinal scales for both treatment groups were analyzed by Guttman Scalogram Analysis. Affective gain scores were then calculated and punched on computer cards in addition to the cognitive

scores and appropriate group and individual identification numbers.

Visual inspection indicated little or no correlation between the dependent variables. As a result, the statistical analysis was changed from a multivariate analysis of variance to two univariate one-way analyses of variance. A computer routine was selected which would also generate a correlation coefficient between the dependent variables to confirm the appropriateness of the statistical model chosen for the analysis. An alpha level of .05 was selected as the point at which the null hypotheses could be rejected. All statistical analyses were computed on a Control Data Corporation 3600 computer at the Michigan State University Computer Center.

Summary

The population for this study consisted of 46 graduate students in an educational media course. These students were divided into two experimental groups of 23 students each. A repeated measures design was utilized to measure affective and cognitive learning gain relative to differing forms of mediated presentation. One experimental group received a multiple-image presentation while the second group received a 16mm film presentation.

Attitudinal shift was measured by two forms of a Guttman scale which had been pretested for equivalency. One form served as the pretest and the second form as the

posttest. A posttest-only cognitive measure was taken based on the recall of specific information available only as a result of experiencing the presentation.

Unidimensionality of the attitudinal instruments was determined by Guttman Scalogram Analysis. Statistical analysis of affective and cognitive learning was by analysis of variance. All hypotheses were tested at the .05 level for significance.

CHAPTER IV

ANALYSIS OF RESULTS

This chapter is divided into two sections. The first section will contain the results of the analysis of the attitudinal scales used in the experiment to determine unidimensionality of the affective instruments. The second section will contain the results of the statistical analysis of gain scores generated by the affective and cognitive measures.

Analysis of Attitudinal Scales

Prior to performing a statistical analysis on the data generated by the attitude scales, it was necessary to determine if the scales were unidimensional, i.e., measuring a single variable. Guttman Scalogram Analysis was used in analyzing each of the two scales used with the two treatment groups. Coefficients of reproducibility are given in Table 2.

It will be remembered from the previous discussion of Guttman Scalogram Analysis that a coefficient of reproducibility of .85 is the generally accepted level for scalability. This figure is for dichotomous response items, however, and the slightly lower figures resulting

TABLE 2.--Guttman coefficients of reproducibility for experimental study.

Treatment Group	Form 1 (Pretest)	Form 2 (Posttest)
16mm film	.85	.83
Multiple-image	.82	.81

for the scales used in this experiment are acceptable since the items contain multiple response categories.

Each scale used in this experiment contained 8 items with 5 response categories. Three items on each scale were collapsed from 5 to 4 response categories to increase the coefficients of reproducibility.

Further analysis of the scales indicated that no items contained more than 80 percent of the subjects in any response category, therefore the scales met Torgerson's requirement relative to extreme marginals.[1]

As a result of the foregoing analysis, the scales were judged to be unidimensional and subsequently subjected to statistical analysis.

Statistical Analysis

The initial concern was to determine the appropriateness of the statistical model that was selected to

[1]Torgerson, op. cit., p. 324.

analyze the data generated by the experiment. The correlation coefficient for the cognitive and affective variables overall was .08 which indicated that there was no significant correlation between the variables.[2] The absence of any correlation between the dependent variables confirmed the appropriateness of utilizing two univariate one-way analyses of variance to test for significance.

Affective Learning

> Null Hypothesis 1a: There will be no difference in the amount of attitudinal learning relative to presentation content between subjects receiving the multiple-image presentation and subjects receiving the film presentation.
>
> Alternate Hypothesis 1a: Those subjects receiving the multiple-image presentation will show greater attitudinal learning relative to presentation content than will the subjects receiving the film presentation.

As indicated in Table 3, a comparison of gain scores between treatment groups yielded an F-statistic of .9777 which is not significant at the .05 level.[3] The null hypothesis was, therefore, not rejected.

Cognitive Learning

> Null Hypothesis 2a: There will be no difference in the amount of cognitive learning relative to presentation content between subjects receiving the

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[2]All computer print-outs related to statistical analyses are reproduced in Appendix D.

[3]For a directional test at the .05 level, an F value of 2.82 would define the region of rejection of the null hypothesis.

TABLE 3.--Analysis of variance for affective learning.

Source of Variance	Sum of Squares	Degrees of Freedom	Mean Square	F Statistic	Significance Probability
Between Categories	17.0434	1	17.0434	0.9777	0.328
Within Categories	766.9565	44	17.4308		
Total	784.0000	45			

multiple-image presentation and subjects receiving the film presentation.

Alternate Hypothesis 2a: Those subjects receiving the multiple-image presentation will show greater cognitive learning relative to presentation content than will the subjects receiving the film presentation.

Table 4 contains the results of the analysis of variance for cognitive learning. The comparison of scores between treatment groups yielded an F-statistic of 2.0460 which is not significant at the .05 level.[4] As a result, the null hypothesis was not rejected.

Additional Analyses

While no significant differences were found between treatment groups, the mean gain scores were computed to indicate the directionality of the treatment effect relative to the domain of learning. As indicated in Table 5, a slightly greater mean gain in affective learning was achieved by the group receiving the multiple-image presentation. Conversely, the group receiving the film presentation showed greater cognitive learning. The reader is cautioned to remember, however, that the lack of significance indicates that whatever differences exist could be the result of chance as well as treatment.

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[4]For a directional test at the .05 level, an F value of 2.82 would define the region of rejection of the null hypothesis.

TABLE 4.--Analysis of variance for cognitive learning.

Source of Variance	Sum of Squares	Degrees of Freedom	Mean Square	F Statistic	Significance Probability
Between Categories	11.5000	1	11.5000	2.0460	0.160
Within Categories	247.3043	44	5.6205		
Total	258.8043	45			

TABLE 5.--Mean gain scores on affective domain and mean posttest scores on cognitive domain.

Treatment Group	Affective Domain	Cognitive Domain
16mm film	3.39	7.43
Multiple-image	4.60	6.43

Again, while there were no significant differences in affective and cognitive learning between treatment groups, the question naturally arises as to whether or not there was significant learning irrespective of treatment. The gain scores, irrespective of their group identification, were analyzed to test for non-zero change in affective and cognitive responses. Because differences between groups had not been found, the variability in gain scores between groups and within groups was pooled to arrive at an estimated standard error for the gain scores.

Upon observing the figures in Table 6, it can be concluded that there was a significant change in affective learning (.05 level) but that the change was not group specific, i.e., both treatments were equally effective in producing a positive change in affective learning.

Similarly, both the multiple-image and the film treatments resulted in a significant change in cognitive learning (.05 level) but neither treatment was more effective than the other in producing the change.

TABLE 6.--Analyses of variance for affective and cognitive learning irrespective of treatment.

Domain of Learning	Sum	Sum of Squares	Sum of Squared Deviations from Mean	Error of Mean	F of Mean	Significance of the Mean
Affective	184.0000	1520.0000	784.0000	0.6154	42.2449	<.05
Cognitive	319.0000	2471.0000	258.8043	0.3536	384.6489	<.05

Summary

The two forms of the attitudinal scale used in this experiment were analyzed by Guttman Scalogram Analysis to establish unidimensionality. Coefficients of reproducibility for the scales ranged from .81 to .85 and the number of subjects in the most popular response categories was generally well below the 80 percent level. The scales were judged to be unidimensional. Gain scores on the affective domain and posttest scores in the cognitive domain were calculated for statistical analysis.

Using a univariate analysis of variance to test each of the hypotheses at the .05 level, no significant differences were found in affective or cognitive learning between treatment groups. A comparison of the mean scores indicated a slightly greater gain in affective learning with the multiple-image presentation, while the 16mm film presentation resulted in slightly higher cognitive learning. Again, these were not statistically significant differences.

Analysis of variance for affective and cognitive learning irrespective of treatment yielded significance at the .05 level. These analyses indicate that while one treatment was not significantly more effective than the other, both treatments were effective in producing positive increases in affective and cognitive learning.

CHAPTER V

SUMMARY AND CONCLUSIONS

The purpose of this study was to determine if a multiple-image slide and audio presentation would result in greater affective and/or cognitive learning than similar content presented by a 16mm sound film. Since the audio portion of both presentations was reproduced from the same 12 minute master tape recording, neither audio nor length of presentation was considered variables. Both presentations were photographed in color from the same artwork.

Literature on film research revealed a large number of empirical studies demonstrating the capability of film to effect attitudinal change and increase cognitive learning. Many of the studies, however, compared film with conventional classroom techniques which included a highly variable component, the human element. Those studies which did compare film with other mediums usually used single-image slides. No studies were found which compared film to multiple-image presentation.

Few empirical studies have been conducted in multiple-image presentation modes. As a result, the literature generally reflects speculation rather than established fact. Opinions tend to support the capability of

the medium to operate in both affective and cognitive learning. The small amount of empirical research available often compared multiple-image presentation with single-image presentation. Significant increases in cognitive learning have been found, but the overall results are somewhat contradictory. Only one prior study was found which attempted to measure attitudinal change as a result of subjects receiving a multiple-image presentation. The results of the study were inconclusive due to the use of a semantic differential attitude scale which was not unidimensional.

The population for the experiment consisted of 46 graduate students enrolled in a media course at Michigan State University. These students were randomly assigned to one of two treatment groups. A repeated measures design was utilized with affective gain and cognitive performance scores comprising the dependent variables. The independent variable was multiple-image presentation and film presentation.

The stimulus materials used for the experiment consisted of a story about the development of instruction at a university in a mythical kingdom. The events in the story were such that individual versus team efforts in developing instruction formed a continuum on which attitudinal change could be measured.

The multiple-image and 16mm presentations were experienced simultaneously by the two experimental groups in separate classrooms. The 16mm film was shown on a screen 8 feet wide. The multiple-image slide presentation was shown on three screens placed side-by-side, each of which was 8 feet wide. The multiple-image presentation utilized three-screen panoramas, two-screen panoramas with an independent image on the third screen, and three independent and independently-changing images related to the development of a single concept. All slide changes were synchronized to the audio tape by a multiple-channel programming unit.

To measure attitude change, two Guttman scales were constructed and tested in a pilot study. The statements used in the scales each contained 5 response categories ranging from "strongly agree" to "strongly disagree." The results of the pilot study indicated that the scales were unidimensional and equivalent. One form of the scale was used as the pretest for each treatment group with the second form being used as the posttest.

A posttest-only cognitive measure was used to avoid the possibility of the pretest acting as an advanced organizer for the subjects. The questions were designed to measure information available only as a result of receiving the presentation.

Prior to statistically analyzing the data generated by the experiment, it was necessary to determine if the scales were unidimensional, i.e., measuring a single variable. Guttman Scalogram Analysis was used and the unidimensionality of the scales was established.

Two univariate analyses of variance were utilized in determining the significance of the results. The first analysis compared the gain scores in affective learning for the two treatment groups. The second analysis compared the posttest scores in cognitive learning. Directional hypotheses were tested at the .05 level.

Conclusions

Data analysis supports the following conclusions:

1. In comparing the relative effectiveness of multiple-image slide and audio presentation with a 16mm sound film, no significant differences were found in the amount of attitudinal change elicited as a result of the presentation mode.

2. No significant differences were found between treatment groups relative to the amount of cognitive learning resulting from receiving the presentations.[1]

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[1]Although not statistically significant, a comparison of the mean scores indicated a slightly greater gain in affective learning with the multiple-image presentation, while the 16mm film presentation resulted in slightly greater cognitive learning.

3. Analyses of variance for affective and cognitive learning irrespective of treatment yielded significant gains at the .05 level. These analyses indicate that while one treatment was not significantly more effective than the other, both treatments were effective in producing positive increases in affective and cognitive learning.

Discussion of Results

Analysis of the data indicated that a multiple-image slide and audio presentation can result in significantly increased affective and cognitive learning, but this experiment did not establish that it was more effective than the 16mm sound film presentation.

The nature of the presentation may have been a limiting factor on the effectiveness of the multiple-image technique. The evolution of a sequential story is particularly well suited to the film medium, but it may have failed to fully exploit the strengths of the multiple-image technique. The tendency of the 16mm film to evoke greater cognitive learning than resulted from the multiple-image presentation tends to support this conclusion.

The multiple-image presentation evoked a similar tendency toward greater change in affective learning than evidenced by the film presentation. This could be the result of the involvement of the subjects in the wide screen presentation and/or the use of the various image patterns.

It is clear that many variables may be operating within the multiple-image technique. Some of these include the size of the screen(s), the number of images, panoramas versus individual images changing randomly or by preset programming, flashing images, image redundancy, and comparison and contrast techniques.

The purported strength of the technique may lie in a particular configuration yet to be empirically tested. Conversely, it may eventually be established that the effectiveness of the technique is directly related to the preparation and organization of the materials rather than to intrinsic properties of the technique itself.

This experiment is viewed as one small part in the number of experiments that will have to be conducted before a synthesizing of the results can establish the best educational uses of the multiple-image technique.

Implications for Future Research

This study should be replicated using a different psychological object toward which group attitude can be measured. The careful selection of the psychological object (such as a controversial social issue) would result in larger populations being available from which larger treatment groups could be drawn. The increased size of the sample would increase the statistical accuracy of mean group attitude measurement.

Experiments should also be conducted to determine if sequential or simultaneous images are more effective in changing attitude. An economically reasonable way to compare film and multiple-images would be to reproduce specific frames of an existing attitude film and project these frames simultaneously with slide projectors. The sound track of the film could be transferred to audio tape to make audio and length of presentation constants.

Similar experiments should be conducted on sequential versus simultaneous images in cognitive learning. Again, the careful selection of an existing cognitive film and the reproduction of specific frames for slides should result in an economically feasible study.

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APPENDICES

APPENDIX A

SCRIPT FOR PRESENTATIONS

(WITH SLIDE CUES)

THE SHAPING OF INSTRUCTIONAL DEVELOPMENT

- OR -

THAT'S A GOOD IDEA . . BUT . .

* * * * *

Written and Produced by:

Larry Atherton

Pat Harrison

* * * * *

Michigan State University
Instructional Media Center
East Lansing, Michigan

April, 1970

Number	Slide	Narration
1A-1B-1C	Blank	
2A-2B-2C	Open Title	[1]THE SHAPING OF INSTRUCTIONAL DEVELOPMENT - [2]OR - [3]THAT'S A GOOD IDEA . . . BUT . . .
3A-3B-3C	Earth Curve	[123]Once upon a time when the earth was young and innocent, there was a beautiful kingdom called Unstamer. It was the envy of all the other kingdoms -
4A-4B-4C	Walled City	- [123]since it was the most beautiful and prosperous of them all. It was a very peaceful kingdom. They hadn't used their catapults for years and all the local dragons had been slain a long time ago -
5A-5B-5C	People on Street	- [123]so everybody in the kingdom felt safe, secure and happy.

Number	Slide	Narration
6A-6B-6C	King collecting taxes	[1 2 3]The ruler of Unstamer was a kind and benevolent monarch, somewhat given to random and ambiguous commitments, who collected taxes from those who prospered and distributed money for worthy projects.
7A-7B-7C	University	[1 2 3]And the most worthy project of all was a great university which the king had established for his people - Megolamedia U. Ah, it had everything necessary to be a successful university -
8B	Committee	[2] - there were committee meetings -
8C	research	[3] - research projects sponsored by the king -
8A	publish	[1] - the usual amount of publishing and perishing -
9B	Students	[2] - the usual amount of student protests -
9C	Faculty	[3] - there were faculty teas enjoyed by all -
9A	Football	[1] - and most important of all, a winning football team.

Number	Slide	Narration
10A-10B-10C	University	[1 2 3]These things, of course, kept the administrators and professors very busy - but there was yet another activity which took place. It was referred to by some as teaching -
11A-11B-11C	Barren Hall	[1 2 3] - and by others, who were more optimistic, as learning. And it is here that we meet the hero of our story, for it was in old Barren Hall that -
12A-12B-12C	Prof. in "Seminar"	[1 2 3] - a young professor was struggling to improve his instruction and focus on the needs of the individual learner in the face of increasing enrollments in the university.
13C	Prof in Seminar	[3]Prof: This is just a seminar. You should see the size of my lectures! And so, between classes -

Number	Slide	Narration
13A-13B-14C	Prof. in office (cloud)	[1 2 3] - the young professor sat in his office trying to get some idea to take shape. But, alas, as everyone knows, good ideas are hard to come by.
14A-14B-15C	Prof in seminar	[1 2 3]In the meantime, of course, our hero continued to face his rather large seminars and do the best that he could with the help of a couple graduate assistants.
15A-15B-16C	Hallway Students	[1 2 3]One day, he explained his problem to a fellow professor and asked for his advice, which in itself amazed the older professor who mumbled something about hope springing eternal -
16A-16B-17C	Hallway King & Money	[1 2] - and replied - Old Prof: Well, I'll tell you. The kind has been [3]spending his money mostly for hardware. Downstairs in the storage area you'll find all kinds of things that are supposed to be helpful.

Number	Slide	Narration
17A-17B-18C	Blank slides	The young professor immediately went downstairs to the [1 2 3]dark storage room, and when he turned on the lights, it was his turn to be amazed.
18B 19C 18A	hardware	[2] [3] [1]
19B 20C 19A	hardware	[2] [3] [1]
20B 21C 20A	hardware	[2] [3] [1]

Number	Slide	Narration
21B 22C 21A	hardware	[2] [3] [1]
22A-22B-23C	Prof in office cloud	[1 2 3]The professor returned to his office and again tried to develop some method of improving his instruction. Needless to say, he had been duly impressed with all the -
24C	cloud shapes	- hardware that the king had provided, but he didn't quite know [3]what to do with it. Suddenly an idea began forming - and then in a sudden
23A-23B-25C	prof excited rough shape	[1 2 3]burst of genius he had it! Or at least, a rough idea that did show promise. Enthusiastically, he set out to find the old professor -

Number	Slide	Narration
26C	Travel	so he could show the idea to him. [3](Music.....)[1 2]
24A-24B 27C	Profs in Hall + shape	Old Prof: [3]Pretty good idea you got there. You know, I seem to remember seeing something called A.V. - or media - or something - some kind of service - somewhere. You oughtta check that out.
25A-25B-28C	Building & Travel	- - - and of course, that's exactly what he did. [1 2 3](Music . . . . .)
29C	New Travel	
26A-26B	Inst. Dev.	[1 2]Prof: . . . .and that's basically the idea I had in mind. [3]It's still a little fuzzy, but do you think you can help me?
30C	Rough Idea	
27A-27B		[1 2]Inst: Well, we'll certainly try. I think we might be able to sharpen it up by modifying the emphasis ..... (Trumpets)[3] Inst: A good place to start would be to get the support of your department head.
31C	Idea Sharpened	

Number	Slide	Narration
28A-28B-32C 33C	Building and Travel New Travel	[1 2 3] .....(Music)[3]..... [1 2]
29A-29B 34C	Dept Head Idea	Prof: . . .therefore, [3]I think the course could be more relevant for the individual student and it may be fundable.
30A-30B	Dept Head	[1 2]Dept Head: I think that's a good idea - but - we'll have to make a couple of changes to get the other professors in the department to go along with the . . . .
35C 31A-31B	Idea Modify Dept Head	[3] .....(Saw sound effect)..... Dept. Head: .[1].[2]. so it's fine with me if you want to pursue this further, but I would like to be kept informed.

Number	Slide	Narration
32A-32B-36C 37C	Building and Travel New Travel	1 2 3 .....(Music)[3]..... 1 2
33A-33B 38C	Inst. Dev. Idea	Prof: I've cleared it with the head of my department - you [3]probably noticed the change in the report that I sent you.
39C 34A-34B	Idea Modify Inst. Dev.	Inst. Dev: That change does complicate things a little, but we might be able to neutralize the effect somewhat by . . . 3 1 2 3 .....(Saw sound effect).....
40C	Idea modify	Inst. Dev: . . . so as I see it, the only problem left is funding. Why don't you rewrite that one section and see if the administration will support it?

Number	Slide	Narration
35A-35B-41C 42C	Building and Travel New Travel	[1 2 3] .....(Music)[3].....
36A-36B 43C	Admin. Office Idea	[1 2]Prof: . . . and the people over in media and the head of my department think it would improve things for the learner. [3]What do you think, sir?
37A-37B 44C	Admin. Idea Modify	Admin: That's a good idea - but - it will take a couple [1 2]of changes to get the king's support. This year, he's putting a lot of emphasis on the problems of . . .
45C	Idea Modify	.....[3].....(Saw sound effect)[3]..... Admin: . . . but with just those few minor changes, I'm sure we can get the funds to support the project. Why don't you go ahead with it, but keep me informed - - in triplicate.

Number	Slide	Narration
38A-38B	Prof.	And the young professor began to wonder just what was happening to him, while the administrator thought -
	Administrator	[1 2]Admin: Ah, this will make good press with the king - should help to get our operating budget increased.
39A-39B-46C	Building and Travel	[1 2] .....(Music)[3].....
47C	New Travel	
40A-40B	Ed Psych	[1 2]Inst. Dev: You know our educational psychologist, of course - he's read over the latest draft of your proposal.
48C	Idea	[3]Ed Psych: Yes, and I think it's a good idea - but - I think when you do a task analysis -
41A-41B	Ed Psych	[1 2] - you'll find that a few changes will be required as a result of . . .
49C	Idea modify	[3] [1 2] [3] .....(Saw sound effect) .....

Number	Slide	Narrator
42A-42B 50C	Ed Psych Idea Modify	Ed Psych: . . . and then when you have finished putting your objectives in behavioral terms, we'll meet again to go over them.
43A-43B	Prof. office (pacing)	[1][2]So our young hero went back to his office and did a task analysis for his project following the directions that he had been given as closely as possible.
44A-44B	Prof. at Desk	[1][2]He then struggled with rewriting his objectives, putting them in behavioral terms as he had been told - and it was during this process that he was called to yet another meeting.
45A-45B-51C 52C	Building and Travel New Travel	[1][2][3] .....(Music)[3].....

Number	Slide	Narration
46A-46B 53C	Eval. Spec. Idea	[1 2]Inst Dev: This is our evaluation specialist - he's read the latest draft of your proposal [3]and he's very much impressed with your idea.
47A-47B 54C	Eval Spec. Idea Modify	Eval Spec: Yes, I think it is a very good idea - but - in order to measure the learning without violating the assumption of normality in the two way analysis of variance, we should . . . [3] [1 2] .....(Saw sound effect).....
48A-48B	Eval Spec.	Eval Spec: . . . and it will then fit our model so we can test the null hypothesis and perform the necessary post hoc procedures on the variables.
49A-49B 55C	Prof in office thinking Travel route	[1 2]Well, our young hero once again returned to his office and [3]he thought about the route he had travelled in his attempt to do a better job in the classroom.

Number	Slide	Narration
50A-50B	Prof-office	[1 2]He remembered his original idea and how enthusiastic he had been - (Trumpet[3])
56C	original idea	
57C	modify idea	- and he thought about all the modifications that had been made. (Trumpet[3] - sour)
51A-51B	Profs in hall	[1 2]He again went to his fellow professor and told him what had happened to his original idea -
58C	Flowing Chart	[3] - and about all the complex charts and models he had seen
59C	Route Travel	and worked with -
		[3] - and how it seemed to him that he had met himself coming and going. The older professor didn't say a word - he only nodded and smiled a little.
52A-52B-60C	Prof in Seminar	[1 2 3]Meanwhile, the administration had assigned a new name to the professor's course and it attracted many visitors from other universities. But this seemed to leave him with even less time for the students.

Number	Slide	Narration
53A-53B-61C	Barren Hall	[1 2 3]Well, old Barren Hall had grown a little older - its foundation seemed to be crumbling a little - but everyone felt it was still serviceable for awhile.
54A-54B-62C	University	[1 2 3]Outwardly, the university didn't seem any different than it had ever been - it still stood as a symbol of pride for the kingdom's efforts in -
55A-55B-63C	People in street	[1 2 3] - providing for the education of its citizens - and the citizens, of course, still felt safe, secure, and happy.
56A-56B-64C	Walled city	[1 2 3]Ah, but you may be wondering about our young hero. Did he ever get the help he wanted? What advice will he give when a new professor asks him about where to get help with an instructional problem?

Number	Slide	Narration
57A-57B-65C	Earth curve	[1 2 3]It really doesn't matter. After all, this is just a fairy tale. Of course, if you're not living in the Kingdom of Unstamer, I suppose it could matter a great deal . . .
58A-58B-66C	title	[1 2 3] (THE END)
59B	title	[2] (Produced by)
59A-67C	title	[1 2 3] (LARRY ATHERTON - PAT HARRISON)

APPENDIX B

GUTTMAN SCALES FOR

PILOT STUDY

PILOT STUDY--PRETEST

DIRECTIONS

READ THIS PAGE CAREFULLY! DO NOT GO TO THE NEXT PAGE UNTIL YOU ARE INSTRUCTED TO DO SO!

On the following pages, you will be presented with a series of statements concerning the development of instruction. Please respond to each statement by circling the response that best describes how you feel about the statement at this time. Following is an example of what your response choices will be.

strongly agree	/ agree	/ don't know	/ disagree	/ strongly disagree

Abbreviations will be used so that the scale that you actually mark for each statement will look like the illustration below.

SA / A / DK / D / SD

There are no right or wrong answers. Read the statements fairly rapidly and give your first reaction in terms of the extent to which you personally agree or disagree. Do not go back to change responses you have already made.

THANK YOU FOR YOUR COOPERATION

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INSTRUCTIONAL DEVELOPMENT

INSTRUCTIONAL DEVELOPMENT is a term being used to denote a process in which the teacher, as content specialist, is joined by other specialists who then act as a team to solve instructional problems. Other specialists on the team might include an educational psychologist, an evaluation specialist, a media specialist, and others as need depending upon the particular educational problem. A member of the team who is a generalist coordinates the efforts of the various specialists in developing the instruction.

(Continue on to the next page)

1-A

Strongly Agree	/ Agree /	Don't Know	/ Disagree /	Strongly Disagree	
SA /	A /	DK /	D /	SD	1. "For practical purposes, the advantages of the team approach to the development of instruction are outweighed by the disadvantages!"
SA /	A /	DK /	D /	SD	2. "In the future, the development of instruction will be primarily accomplished through teams of specialists!"
SA /	A /	DK /	D /	SD	3. "The team approach to the development of instruction beats down the creative impulses of the most innovative teacher!"
SA /	A /	DK /	D /	SD	4. "In the development of instruction, the team approach can be either good or bad depending on how it is used!"
SA /	A /	DK /	D /	SD	5. "No individual innovator can produce the quality of instruction that will be developed by a team of specialists!"
SA /	A /	DK /	D /	SD	6. "Working with a team of specialists in the development of instruction is not only frustrating, but also unproductive!"
SA /	A /	DK /	D /	SD	7. "The idea of instructional development may be tempting, but always ends up distorting and inhibiting attempts at creative innovation!"
SA /	A /	DK /	D /	SD	8. "The team approach to instructional development has its problems, but it will pay off in the long run!"
SA /	A /	DK /	D /	SD	9. "There is no better approach to the development of instruction than the cooperation of specialists on a team!"
SA /	A /	DK /	D /	SD	10. "The idea of a team of specialists is too inefficient to be practical in the development of instruction!"
SA /	A /	DK /	D /	SD	11. "The team approach to the development of instruction is not just a promise for the future, but has already demonstrated its effectiveness!"

(Continue on to the next page)

(DO NOT GO BACK TO PREVIOUS PAGES) 2-A

Strongly Agree / Agree /	Don't Know / Disagree / Strongly Disagree	
SA / A / DK / D / SD	12.	"The only hope for the effective development of instruction is through the team approach!"
SA / A / DK / D / SD	13.	"In actual practice, the disadvantages of the team approach to developing instruction tend to outweigh the potential advantages!"
SA / A / DK / D / SD	14.	"One creative teacher can produce more innovation than any instructional development team!"
SA / A / DK / D / SD	15.	"In spite of the problems, the team approach to developing instruction can be very effective in the final analysis!"
SA / A / DK / D / SD	16.	"The team approach to the development of instruction has already been shown to be very effective!"
SA / A / DK / D / SD	17.	"The innovative teacher who is trying to develop instruction should beware of wasting valuable time with a team of specialists!"
SA / A / DK / D / SD	18.	"The quality of instruction that a team of specialists produces will be better than can be developed by any individual acting alone!"
SA / A / DK / D / SD	19.	"Using a team of specialists in the development of instruction is frustrating and often unproductive!"
SA / A / DK / D / SD	20.	"The use of teams in instructional development has a great potential, but also brings with it problems and possible frustrations!"
SA / A / DK / D / SD	21.	"The team approach to developing instruction obviously makes sense and it should be encouraged and developed to its full potential!"
SA / A / DK / D / SD	22.	"If you really want instructional change, avoid the lure of the team approach!"

(STOP AT THIS POINT! DO NOT GO BACK OVER YOUR ANSWERS)

PILOT STUDY--POSTTEST

DIRECTIONS

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strongly agree	/ agree /	don't know	/ disagree /	strongly disagree

Abbreviations will be used so that the scale that you actually mark for each statement will look like the illustration below.

SA / A / DK / D / SD

There are no right or wrong answers. Read the statements fairly rapidly and give your first reaction in terms of the extent to which you personally agree or disagree. Do not go back to change responses you have already made.

THANK YOU FOR YOUR COOPERATION

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(Continue on to the next page)

1-B

Strongly Agree	/ Agree /	Don't Know	/ Disagree /	Strongly Disagree

SA / A / DK / D / SD 1. "Working with a team of specialists in the development of instruction is not only frustrating, but also unproductive!"

SA / A / DK / D / SD 2. "In the future, the development of instruction will be primarily accomplished through teams of specialists!"

SA / A / DK / D / SD 3. "The team approach to instructional development has its problems, but it will pay off in the long run!"

SA / A / DK / D / SD 4. "For practical purposes, the advantages of the team approach to the development of instruction are outweighed by the disadvantages!"

SA / A / DK / D / SD 5. "The team approach to the development of instruction beats down the creative impulses of the most innovative teacher!"

SA / A / DK / D / SD 6. "No individual innovator can produce the quality of instruction that will be developed by a team of specialists!"

SA / A / DK / D / SD 7. "Using a team of specialists is too inefficient to be practical in the development of instruction!"

SA / A / DK / D / SD 8. "In the development of instruction, the team approach can be either good or bad depending on how it is used!"

SA / A / DK / D / SD 9. "The team approach to the development of instruction is not just a promise for the future, but has already demonstrated its effectiveness!"

SA / A / DK / D / SD 10. "The idea of the instructional development team may be tempting, but always ends up distorting and inhibiting attempts at creative innovation!"

SA / A / DK / D / SD 11. "There is no better approach to the development of instruction than the cooperation of specialists on a team!"

(Continue on to the next page)

(DO NOT GO BACK TO PREVIOUS PAGES) 2-B

Strongly Agree / Agree /	Don't Know / Disagree / Strongly Disagree	
SA / A / DK / D / SD	12.	"Using a team of specialists in developing instruction is frustrating and often unproductive!"
SA / A / DK / D / SD	13.	"The team approach to the development of instruction has already been shown to be very effective!"
SA / A / DK / D / SD	14.	"The team approach to instructional development obviously makes sense and it should be encouraged and developed to its full potential!"
SA / A / DK / D / SD	15.	"The innovative teacher who is trying to develop instruction should beware of wasting valuable time with a team of specialists!"
SA / A / DK / D / SD	16.	"The use of teams in developing instruction has a great potential, but also brings with it problems and possible frustrations!"
SA / A / DK / D / SD	17.	"The quality of instruction that a team of specialists produces will be better than can be developed by any individual acting alone!"
SA / A / DK / D / SD	18.	"In spite of the problems, the team approach to developing instruction can be very effective in the final analysis!"
SA / A / DK / D / SD	19.	"In actual practice, the disadvantages of the team approach to the development of instruction tend to outweigh the potential advantages!"
SA / A / DK / D / SD	20.	"One creative teacher can produce more innovation than any instructional development team!"
SA / A / DK / D / SD	21.	"If you really want instructional change, avoid the lure of the team approach.
SA / A / DK / D / SD	22.	"The only hope for the effective development of instruction is through the team approach!"

(Continue on to the next page)

1. Using only the space indicated below--indicated by the lines--answer the following question:

   What is the main point of the story?

(Continue on to the next page)

2. Name the kingdom in which the fairy tale on instructional development took place.

3. What was the name of the university which the king established for his people?

4. Name two other things that the king did for the university after it was established.

5. In the real world, who plays the part of the king?

6. Did the people outside of the university structure perceive any change during the course of the story?

7. Name 3 of the components that make a successful university according to the fairy tale.

8. Name 2 people who modified the young professor's idea and the reason they gave for modifying it.

   a.

   b.

(End of test - Again, thank you!)

APPENDIX C

GUTTMAN SCALES

FOR EXPERIMENT

EXPERIMENT--PRETEST

DIRECTIONS

READ THIS PAGE CAREFULLY! DO NOT GO TO THE NEXT PAGE UNTIL YOU ARE INSTRUCTED TO DO SO!

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Strongly Agree	/ Agree /	Undecided	/ Disagree /	Strongly Disagree

Abbreviations will be used so that the scale that you mark for each statement will look like the illustration below.

SA / A / UN / D / SD

Read the statements fairly rapidly and give your first reaction in terms of the extent to which you personally agree or disagree. Do not go back to change responses you have already made.

THANK YOU FOR YOUR COOPERATION

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Specialists on the team might include an educational psychologist, an evaluation specialist, a media specialist, and others as needed depending upon the particular educational problem.

Since each member of the team is working in a highly specialized area, the teacher works with them individually rather than as a group. A member of the team who is a generalist coordinates the efforts of the team in solving instructional problems.

(DO NOT TURN THE PAGE UNTIL INSTRUCTED TO DO SO)

Strongly Agree	/ Agree /	Undecided /	Disagree /	Strongly Disagree

SA / A / UN / D / SD 1. "Working with a team of specialists in the development of instruction is not only frustrating, but also unproductive!"

SA / A / UN / D / SD 2. "In the future, the development of instruction will be primarily accomplished through teams of specialists!"

SA / A / UN / D / SD 3. "The team approach to instructional development has its problems, but it will pay off in the long run!"

SA / A / UN / D / SD 4. "The team approach to the development of instruction beats down the creative impulses of the most innovative teacher!"

SA / A / UN / D / SD 5. "No individual innovator can produce the quality of instruction that will be developed by a team of specialists!"

SA / A / UN / D / SD 6. "The team approach to the development of instruction is not just a promise for the future, but has already demonstrated its effectiveness!"

SA / A / UN / D / SD 7. "The idea of the instructional development team may be tempting, but always ends up distorting and inhibiting attempts at creative innovation!"

SA / A / UN / D / SD 8. "There is no better approach to the development of instruction than the cooperation of specialists on a team!"

(STOP AT THIS POINT! DO NOT GO BACK OVER YOUR ANSWERS!)

EXPERIMENT--POSTTEST

DIRECTIONS

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Strongly Agree	/ Agree /	Undecided /	Disagree /	Strongly Disagree

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Strongly Agree	/ Agree /	Undecided /	Disagree /	Strongly Disagree

SA / A / UN / D / SD 1. "The team approach to instructional development obviously makes sense and it should be encouraged and developed to its full potential!"

SA / A / UN / D / SD 2. "The innovative teacher who is trying to develop instruction should beware of wasting valuable time with a team of specialists!"

SA / A / UN / D / SD 3. "Using a team of specialists in developing instruction is frustrating and often unproductive!"

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SA / A / UN / D / SD 7. "If you really want instructional change, avoid the lure of the team approach!"

SA / A / UN / D / SD 8. "The only hope for the effective development of instruction is through the team approach!"

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Strongly Agree	/ Agree /	Undecided /	Disagree /	Strongly Disagree

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   What is the main point of the story?

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2. Name the kingdom in which the fairy tale on instructional development took place.

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4. Name two other things that the king did for the university after it was established.

5. In the real world, who plays the part of the king?

6. Did the people outside of the university structure perceive any change during the course of the story?

7. Name 3 of the components that make a successful university according to the fairy tale.

8. Name 2 people who modified the young professor's idea and the reason they gave for modifying it.

   a.

   b.

(End of test - Again, thank you!)

APPENDIX D

STATISTICAL ANALYSES

EXPERIMENT--PRETEST

DIRECTIONS

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Strongly Agree	/ Agree /	Undecided /	Disagree /	Strongly Disagree

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Strongly Agree	/ Agree /	Undecided /	Disagree /	Strongly Disagree

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SA / A / UN / D / SD 7. "The idea of the instructional development team may be tempting, but always ends up distorting and inhibiting attempts at creative innovation!"

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(STOP AT THIS POINT! DO NOT GO BACK OVER YOUR ANSWERS!)

EXPERIMENT--POSTTEST

DIRECTIONS

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Strongly Agree	/ Agree /	Undecided /	Disagree /	Strongly Disagree

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Strongly Agree	/ Agree /	Undecided /	Disagree /	Strongly Disagree

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SA / A / UN / D / SD 8. "The only hope for the effective development of instruction is through the team approach!"

(CONTINUE ON TO THE NEXT PAGE)

(DO NOT GO BACK TO PREVIOUS PAGES)

1. Name the kingdom in which the fairy tale on instructional development took place.

2. What was the name of the university which the king established for his people?

3. Name two other things that the king did for the university after it was established.

4. Did the people outside of the university structure perceive any change during the course of the story?

5. Name 3 of the components that make a successful university according to the fairy tale.

   a.

   b.

   c.

6. Name 2 people who modified the young professor's idea and the reason they gave for modifying it.

   a. person -

      reason -

   b. person -

      reason -

(END OF TEST)

AGAIN - THANK YOU!

APPENDIX D

STATISTICAL ANALYSES

DISSERTATION DATA FOR L. ATHERTON --3 FEB 1971

CURRENT TIME 1724 - 06 DATE 02/10/71
ELAPSED SINCE LAST CURRENT TIME 0.00 SECONDS

```
U DISSERTATION DATA FOR L. ATHERTON --3 FEB 1971                    (STAT CONTROL CARD)
L 1=GROUP,AFFECT,COGNIT                                             (STAT CONTROL CARD)
2,3=AOV(1) STD1,NOM=1                                               (STAT CONTROL CARD)
FORMAT(F1.0,5X,F3.0,5X,F3.0)                                        (FORMAT)
```

1ST RAW OBSERVATION

GROUP	AFFECT	COGNIT
1	2	3
1.00000000	5.00000000	8.00000000

1ST TRANSFORMED OBSERVATION (FROM RAW OBSERV. NO. 1)

AFFECT	COGNIT	GROUP
2	3	1
5.00000000	8.00000000	1.00000000

```
END OF DATA                                                         (STAT CONTROL CARD)
```

DATA INPUT TERMINATED BY END OF DATA CARD

TOTAL RAW OBSERVATIONS= 46
TOTAL OBSERVATIONS DROPPED= 0
TOTAL OBSERVATIONS IN PROBLEM= 46

SUMS OF 46 RAW OBSERVATIONS

GROUP	AFFECT	COGNIT
1	2	3
69.00000000	184.00000000	319.00000000

DISSERTATION DATA FOR L. ATHERTON --3 FEB 1971

CURRENT TIME 1724 • 07 DATE 02/10/71
ELAPSED SINCE LAST CURRENT TIME 0.02 SECONDS

S T A T I S T I C S F O R E A C H C A T E G O R Y

DEPENDENT VARIABLE IS X(2) AFFECT

CATEGORY VARIABLE IS X(1) GROUP

(OVERALL) MINIMUM VALUE	MAXIMUM VALUE	SUM	FREQ	MEAN	MEAN INCREMENT	SUM OF SQUARES	STANDARD DEVIATION	SUM OF SQUARED DEVIATIONS FROM THE MEANS
-6,000000	16,0000	184,000000	46	4,00000000		1520,00000000	4,17399356	784,000000
	CATEGORY							
	1,000000	78,000000	23	3,39130435	-0,608696	462,000000	2,996045	197,478261
	2,000000	106,000000	23	4,60869565	0,608696	1058,000000	5,087767	569,478261

DISSERTATION DATA FOR L. ATHERTON --3 FEB 1971

CURRENT TIME 1724 + 07 DATE 02/10/71
ELAPSED SINCE LAST CURRENT TIME 0.10 SECONDS

A N A L Y S I S O F V A R I A N C E T A B L E (ALLOWS A SEPARATE MEAN FOR EACH CATEGORY)

DEPENDENT VARIABLE IS X(2) AFFECT
CATEGORY VARIABLE IS X(1) GROUP

SOURCE OF VARIANCE	SUM OF SQUARES	DEGS. OF FREEDOM	MEAN SQUARE	F STATISTIC	APPROX. SIGNIFICANCE PROBABILITY OF F STAT.
BETWEEN CATEGORIES	17.04347826	1	17.04347826	0.97778	0.328
WITHIN CATEGORIES	766.95652175	44	17.43083004		
TOTAL	784.00000000	45			

MULTIPLE CORRELATION COEFFICIENT
R: 0.1474
SQUARED (R2) = ETA: 0.0217

DEPENDENT VARIABLE X(2) AFFECT CONTAINS OBSERVATIONS IN ONLY 2 CATEGORIES -- NO LINEAR OR QUADRATIC STATISTICS CALCULATED

DISSERTATION DATA FOR L, ATHERTON --3 FEB 1971

CURRENT TIME 1724 + 07 DATE 02/10/71
ELAPSED SINCE LAST CURRENT TIME 0.11 SECONDS

S T A T I S T I C S F O R E A C H C A T E G O R Y

DEPENDENT VARIABLE IS X(3) COGNIT

CATEGORY VARIABLE 15 X(1) GROUP

(OVERALL) MINIMUM VALUE	MAXIMUM VALUE		SUM	FREQ	MEAN	MEAN INCREMENT	SUM OF SQUARES	STANDARD DEVIATION	SUM OF SQUARED DEVIATIONS FROM THE MEANS
2.000000	12.0000		319.000000	46	6.93478261		2471.00000000	2.39816758	258.804348
		CATEGORY							
		1.000000	171.000000	23	7.43478261	0.500000	1455.00000000	2.889260	183.652174
		2.000000	148.000000	23	6.43478261	-0.500000	1016.00000000	1.700965	63.652174

DISSERTATION DATA FOR L, ATHERTON --3 FEB 1971

CURRENT TIME 1724 • 07 DATE 02/10/71
ELAPSED SINCE LAST CURRENT TIME 0.09 SECONDS

A N A L Y S I S O F V A R I A N C E T A B L E (ALLOWS A SEPARATE MEAN FOR EACH CATEGORY)

DEPENDENT VARIABLE IS X(3) COGNIT
CATEGORY VARIABLE IS X(1) GROUP

SOURCE OF VARIANCE	SUM OF SQUARES	DEGS, OF FREEDOM	MEAN SQUARE	F STATISTIC	APPROX, SIGNIFICANCE PROBABILITY OF F STAT;
BETWEEN CATEGORIES	11,50000000	1	11,50000000	2,04606	0,160
WITHIN CATEGORIES	247,30454781	44	5,62055336		
TOTAL	258,80454781	45			

MULTIPLE CORRELATION COEFFICIENT

R	SQUARED (R2) = ETA
0,2108	0,0444

DEPENDENT VARIABLE X(3) COGNIT CONTAINS OBSERVATIONS IN ONLY 2 CATEGORIES -- NO LINEAR OR QUADRATIC STATISTICS CALCULATED

BASIC STATISTICS FOR THE DISSERTATION

CURRENT TIME 1724 = 25 DATE 02/10/71
ELAPSED SINCE LAST CURRENT TIME 0,00 SECONDS

```
U  BASIC STATISTICS FOR THE DISSERTATION                    (STAT CONTROL CARD)
SSCP(1,,,3)RD1                                             (STAT CONTROL CARD)
```

DATA WHICH WAS READ FROM FILE 1 WAS PREVIOUSLY SAVED BY UNEQ1 AS TRANSFORMED DATA

1ST RAW OBSERVATION

AFFECT	COGNIT	GROUP
2	3	1
5,00000000	8,00000000	1,00000000

1ST TRANSFORMED OBSERVATION (FROM RAW OBSERV. NO. 1)

GROUP	AFFECT	COGNIT
1	2	3
1,00000000	5,00000000	8,00000000

DATA INPUT TERMINATED BY END OF FILE MARK

TOTAL RAW OBSERVATIONS= 46
TOTAL OBSERVATIONS DROPPED= 0
TOTAL OBSERVATIONS IN PROBLEM= 46

SUMS OF 46 RAW OBSERVATIONS

AFFECT	COGNIT	GROUP
2	3	1
184,00000000	319,00000000	69,00000000

BASIC STATISTICS FOR THE DISSERTATION

CURRENT TIME 1724 • 26 DATE 02/10/71
ELAPSED SINCE LAST CURRENT TIME 0.47 SECONDS

T A B L E A

NAME	NUMBER	MINIMUM VALUE	MAXIMUM VALUE	MEAN	STANDARD DEVIATION	SKEWNESS	KURTOSIS
GROUP	1	1.0000000	2.0000000	1.5000000	0.505525	0.000000	1.000000
AFFECT	2	-6.0000000	16.0000000	4.0000000	4.175994	0.348509	3.530586
COGNIT	3	2.0000000	12.0000000	6.9347826	2.398168	-0.235149	2.652833

NAME	NUMBER	SUM	SUM OF SQUARES	SUM OF SQUARED DEVIATIONS FROM MEAN	STANDARD ERROR OF THE MEAN	T OF THE MEAN	F OF THE MEAN	SIG. OF THE MEAN
GROUP	1	69.000000	115.000000	11.500000	0.0745	20.1246	405.0000	<0.0005
AFFECT	2	184.000000	1520.000000	784.000000	0.6154	6.4996	42.2449	<0.0005
COGNIT	3	319.000000	2471.000000	258.804348	0.3536	19.6125	384.6489	<0.0005

BASIC STATISTICS FOR THE DISSERTATION

CURRENT TIME 1724 = 26 DATE 02/10/71
ELAPSED SINCE LAST CURRENT TIME 0.14 SECONDS

SIMPLE CORRELATIONS

	VAR NO.			
GROUP	1	1.00000		
AFFECT	2	0.14744	1.00000	
COGNIT	3	-0.21080	0.08436	1.00000
		1	2	3
		GROUP	AFFECT	COGNIT