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# THE EFFECTS OF INTEGRATING DISCUSSION SESSIONS WITH A SELF-INSTRUCTIONAL COURSE IN AUDIOVISUAL METHODS

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

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BY

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Norman, Oklahoma

1972

THE EFFECTS OF INTEGRATING DISCUSSION SESSIONS WITH A SELF-INSTRUCTIONAL COURSE IN AUDIOVISUAL METHODS

APPROVED BY

DISSERTATION COMMITTEE

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# THE EFFECTS OF INTEGRATING DISCUSSION SESSIONS WITH A SELF-INSTRUCTIONAL COURSE IN AUDIOVISUAL METHODS

## CHAPTER I

## INTRODUCTION

Increased enrollments in public schools and colleges have emphasized the need for innovative techniques and modes of instruction in education. The increasing teacher-student ratio and the trend toward more heterogeneous student populations point to the need for greater teaching efficiency and the use of new instructional methods.

Research in the field of learning and a variety of new technological developments in instructional media have created new modes of thought in the area of instruction. Trow states that: "with the advent of television and self-instructional programs, new possibilities were opened up calling for a re-examination of the whole process in order to discover whether all the available media are being used together to the best advantage."[1]

Since the impact of programmed instruction, other instructional materials have been developed which tend to re-define the role of the

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[1]William Clark Trow, Teacher and Technology: New Designs for Learning (New York: Meredith Publishing Company, 1963), p. 115.

teacher as a disseminator of information to that of a tutor or guide. As more instructional media are being developed to disseminate information, the teacher is left with more time to devote to individual differences and preparation for individualized instruction.

Many self-instructional programs in use today are in the format of programmed instruction. This format characteristically includes a stimulus that demands an immediate overt response. The individual can then check to see if his response is correct. This is immediate knowledge of results and is common to most formal programs of instruction. Recently, however, semi-formal programs such as 2"x2" slides or filmstrips, accompanied by an audio tape, have been effectively used by educators to disseminate information. Usually this type instruction does not provide periodic responses and reinforcement to the individual. This type instruction, if not periodically checked, may allow the student to develop misconceptions about the content.

Peterson, in attempting to relate the auto-instructional approach to theories of learning, used factors identified by Postlewait that are common to self-instructional programs and are believed to enhance learning. These include:

> Opportunity for repetition and pacing determined by the students' need.
>
> Freedom from distraction and availability of interesting media to foster concentration.
>
> Association achieved by interrelating a variety of media.
>
> Use of small sequential steps that can be at least partially controlled by the student.
>
> Use of a communications vehicle appropriate to the objective

to be achieved.[2]

In the past few years, a new approach to the problems of education, including the selection and use of instructional media, has been developed. The "systems approach," a scientific method of planning, organizing, and implementing procedures necessary in accomplishing objectives, has gained much popularity among instructional strategists. This approach begins with a careful examination of expected learnings, including all levels of learning, and the writing of clearly stated, precise behavioral objectives. Learning experiences, for example, may be categorized into those that can be performed best by: (1) individual study, (2) small groups working with a professor, (3) small groups working without a professor, (4) medium sized groups, and (5) large or super large lecture groups. The systems approach is primarily concerned with learning and those who are engaged in learning. It then requires the selection of resources, human and technological, that are most effective and efficient in accomplishing the stated objectives. Trow states:

> The question that faces educators today is not how any one of these instructional media can best be used in the schools as they now are, but rather, how they can best be fitted together, along with the school personnel, all to become not aids or adjuncts but components in an educational system.[3]

There is not, as yet, enough empirical evidence to standardize guidelines that determine what types of learning experiences are most appropriate for desired objectives. Likewise, research has not yet developed enough support to set guidelines which state that one particular medium is

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[2]Carol J. Peterson, "Multi-Sensory Tutorial Instruction In Associate Degree Nursing Education," Audiovisual Instruction, XVI (October, 1971), p. 17.

[3]Trow, op. cit., p. 116.

best for a certain type of learning. Gagné has probably made the most notable attempt at doing this in developing a related taxonomy of behavior and learning with implications for the selection of media to match the instructional situation.

Although research relating instructional techniques to learning theory is rather scarce, some authoritative sources see discussion groups as a logical medium for effective learning. Gagné states:

> One aspect of instruction, however, deserves special mention because it takes a special form. This pertains to the function of knowledge generalization or knowledge transfer. . . For a number of reasons, the instructional mode of organized group discussion is one that appears to be well designed to accomplish this function. When properly led, such discussion not only stimulates the production of new extensions of knowledge by students but also provides a convenient means of critical evaluation and discrimination of these ideas.[4]

Barnlund and Haiman, emphasizing group discussion, state: "We believe that under most circumstances it is better as an educational tool than lectures, films, or other one-way means of communication."[5] Thelen suggests that the smaller a group is the greater amount of the group's time a given person may have, thus giving him greater satisfaction and motivation. He states:

> The smaller group increases the visibility of the non-participant, causing him to become active; it makes the member feel greater responsibility for the success or failure of the group; it establishes greater involvement of the members; and it can work more informally.[6]

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[4]Robert M. Gagné, The Conditions of Learning (New York: Holt, Rinehart, and Winston, Inc., 1965), p. 9.

[5]Dean C. Barnlund and Frank S. Haiman, The Dynamics of Discussion (Boston: Houghton Mifflin Company, 1960), p. 21.

[6]Herbert Thelen, Dynamics of Groups at Work (Chicago: University of Chicago Press, 1954), p. 41.

If education is to be systematically organized into efficient instructional programs, a need for experimentation is essential in determining what elements of a program produce the best "instructional package." It should be determined if self-instructional programs are effective in allowing for individual student differences, that is, allowing the more able students to progress more rapidly while slower students stay with a concept until they have mastered it. It should also be determined by experimentation whether or not programs labeled as self-instructional are, in fact, self-supporting or whether they need supplementary support from other instructional media.

## Need for the Study

A specific need for experimental research at the University of Oklahoma involving the course "Audiovisual Methods In Teaching" is essential since the course will eventually be required for all candidates seeking a teaching certificate in the College of Education. Approximately 350 students will eventually be enrolled in the self-instructional course during the year. Although research has been done that indicates the program is as effective as the traditional method of teaching the course, further research is needed to determine whether the program is, in fact, self-instructional, or whether additional instruction is needed to maximize effective and efficient learning. To help eliminate inefficient learning practices the following problem was proposed for study.

## Statement of the Problem

The problem of this study was to determine whether the course "Audiovisual Methods In Teaching" was effective in achieving the objectives of the self-instructional course or whether additional instruction

was necessary to accomplish the objectives of the course. More specifically, the problem was to determine whether significant differences existed between achievement scores of individuals who completed only the self-instructional units and those individuals who completed the self-instructional units and attended various additional instructional treatments.

## Hypotheses

With the assumption that all students completed each self-instructional unit in the course, the study required testing the following hypotheses:

(1) Students who complete a self-instructional unit and participate in a group discussion session will score significantly higher on achievement tests than students who complete only the self-instructional unit.

(2) Students who complete a self-instructional unit and participate in an instructor-led small group discussion session will score significantly higher on achievement tests than students who complete the self-instructional unit and engage in a student-led small group discussion session.

(3) Students who complete a self-instructional unit and participate in an instructor-led small group discussion session will score significantly higher on achievement tests than students who complete the self-instructional unit and participate in an instructor-led large group discussion session.

## Limitations

This study was limited to the validity and reliability of

instruments designed and used for comparative analysis.

This study was limited to students enrolled in the basic audio-visual course at East Central State College, Ada, Oklahoma, during the Spring semester of the year 1972.

## Definition of Terms

Discussion group: persons who perceive each other as participants in a common activity and interact dynamically with each other through the use of spoken language.

Filmstrip viewer: a machine which projects the image of a 35MM filmstrip onto a screen built into the machine.

Self-instruction: self-supporting instructional activities which do not require the presence of an instructor.

Small group: a group containing eight to twenty persons.

Large group: a group containing fifty or more persons.

## Procedure and Design

This study was designed to determine whether relationships existed between the dependent variable, achievement, in the course "Audio-visual Methods In Teaching" and the independent variables, group discussion, group size, and the presence or absence of an instructor in group discussion sessions.

Before conducting the experiment several activities were deemed appropriate which necessitated a careful examination of the course content. These included:

(1) Defining in behavioral terms the objectives for each unit of the self-instructional course;

(2) Identifying the concepts to be learned in each unit;

(3) Identifying the cognitive and psychomotor domains of learning as they may or do appear in each of the concepts.

These activities were necessary to establish criteria to be used as a guide in the preparation of an instrument designed to measure the effectiveness of the various treatment levels of the experiment.

Because the self-instructional course was designed to include most of the content of a traditional course, objective tests were designed to measure achievement levels in the cognitive and psychomotor domains. Most of the content, however, and most of the test items dealt with cognitive learning in the areas of knowledge acquisition, knowledge retention and understanding. Many of the questions that involved equipment operation required some degree of skill learning and logical structure of knowledge acquisition that tended to measure psychomotor learning.

Since little work has been done in areas of the affective domain, a scale was constructed to measure students' attitudes toward the self-instructional treatments specifically designed for this study.

The subjects for the experiment were 104 students enrolled in the basic audiovisual methods course at East Central State College, Ada, Oklahoma, during the Spring semester of 1972. This included students seeking teaching certificates in special education, elementary and secondary education. The decision to use these students was based on two factors. First, insufficient numbers of students were enrolled in the equivalent course taught at the University of Oklahoma during the Spring semester of 1972. Secondly, during the interim period between semesters

at East Central State College, approximately 30 students were enrolled in a "mini-course" containing the same content used during the regular semester. This enabled the investigator to run a pilot study that helped eliminate the weaker points of the experimental design and to revise the procedures accordingly. It also provided the investigator an opportunity to establish the reliability of test items to be used in the later study.

An item analysis was run to eliminate the obvious unreliable items and the Kuder Richardson formula 20 was used to estimate the reliability of the measuring instrument. Items seen as unreliable were eliminated from the instrument.

Instructional media in the form of 35MM filmstrips were developed. Tape recordings to accompany each filmstrip were developed to complete the self-instructional package. Individual filmstrip viewers were placed in each carrel along with cassette tape recorders. This allowed each individual to manually control the audio and visual portions of the self-instructional package.

Group A participated in instruction involving only the use of the self-instructional program. This group was formulated in order to determine the effectiveness of the self-instructional units in accomplishing the pre-determined objectives of those units. Students involved in this group were advised that they could expect no assistance from the instructor in areas relating to the course content. This group was considered the control group.

Group B participated in instruction involving the use of the self-instructional program and instructor-led small group sessions. This group

met with the instructor for a brief period after the completion of selected units. The sessions were designed specifically to solve problems or misconceptions and to answer any questions concerning the course content. No attempt was made to review or summarize specific aspects of the content.

Group C participated in instruction involving the use of the self-instructional program and student-led small group sessions. This group met for brief periods following the completion of selected units and was designed specifically to determine whether or not the instructor was a necessary element in answering questions or clarifying misconceptions arising from the content of the self-instructional program.

Group D participated in instruction involving the use of the self-instructional program and instructor-led large group sessions. This group was formed to determine whether the experimental variable of group size affected scores on achievement tests.

It was envisioned that each of the groups was equal or superior to the others at different points in the program. This, of course, is due to the variety of learning tasks in the self-instructional program. It seemed quite feasible that when testing students over large quantities of content the alternate strong and weak points of each experimental method would tend to cancel each other out, thus concealing the real advantages of each method. In order to partially eliminate this factor, objective tests were originally planned to be administered after each instructional unit was completed and the experimental treatment had been applied. It was later decided, however, that this technique would weaken the study since students in the latter sections would have ample time to

confer with students in earlier sections about the content of the test questions.

An alternative decision was made to eliminate this factor by administering mid-term and final examinations in which all students were tested at the same time. Responses to test items were then grouped into the selected units in which the experimental treatments were applied. Mean scores were used to compare the effectiveness of the various instructional treatments.

## CHAPTER II

## REVIEW OF THE LITERATURE

Some very comprehensive surveys have been made in order to assess the value of various instructional media. An extensive survey of the research in instructional television was conducted by Schramm.[1] Of 393 studies that compared instructional television programs with conventional teaching programs, Schramm concluded that over 65 percent of the cases indicated no significant difference in findings. Studies reporting significant differences favoring one of the instructional methods were often contradictory in nature and lacking in good research design. No studies involving instructional television were deemed as relevant to this study.

Schueler and Lesser[2] investigated the media research centered around the use of television, programmed instruction, and language laboratories. They cited no research which involved an attempt to integrate group discussion sessions into their research designs. Torkelson and Driscoll[3] cited many studies concerned with programmed instruction, language

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[1]Wilbur Schramm, "Learning from Instructional Television," Review of Educational Research, XXXII (April, 1962) pp. 156-67.

[2]Herbert Schueler and Gerald Lesser, Teacher Education and the New Media, (Washington, D.C.: American Association of Colleges for Teacher Education, 1967).

[3]Gerald Torkelson and John Driscoll, "Utilization and Management of Learning Resources," Review of Educational Research, XXXVIII (April, 1968), pp. 129-59.

laboratories, motion pictures, and educational television, but none are particularly relevant to the self-instructional approach used in this study.

Studies reviewed in this chapter are deemed appropriate because of their justification of effective and efficient instructional practices. These studies reflect an integrated attempt at demonstrating--empirically--well organized approaches toward efficient learning and teaching, and the use of various instructional media.

## Programmed Instruction

In the field of programmed instruction, the results of studies frequently indicate "no significant difference" when programmed materials are compared to more traditional forms of instruction. Much of the research done on programmed instruction is irrelevant to this study, but a brief review, at least, is deemed appropriate. Gotkin[4] feels that there are three major reasons for using instruments such as programmed instruction and teaching machines. The lessons are reproducible, there is an increased accuracy in the observations of learning, and a discipline in programming is instilled in the writer.

In his review of self-teaching devices and programmed material, Silberman[5] concluded that programmed groups usually took less training time than the conventionally taught groups. He further concluded that non-significant differences could be expected as a rule rather than the

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[4]Lassar G. Gotkin, "The Machine and the Child," AV Communication Review, XIV (Summer, 1966), pp. 221-41.

[5]Harry E. Silberman, "Self-Teaching Devices and Programmed Materials," Review of Educational Research, XXXI, (April, 1962), pp. 179-93.

exception for this was the most common result of the research reports he reviewed. Silberman freely admitted that the Hawthorne effect may well have been operating in many of the experimental programs.

Schramm,[6] in 1964, prepared an annotated bibliography of thirty-six studies that compared programmed instruction with conventionally taught classes that covered the same content. Only one study indicated a significant difference in favor of conventionally taught classes while seventeen indicated a significant difference in performance favoring programmed methods. Eighteen studies indicated no significant differences.

Goldbreck[7] conducted a study in which programmed instruction was integrated into a course in American government. Test items were constructed which included material covered only in the program, material covered only in class lectures, and material covered in both the program and in class lectures. An item analysis of test responses indicated that students performed significantly better on items covered directly by both the program and the teacher than on items covered by either the program or the teacher alone.

Valdman[8] conducted a study in which students who received instruction in foreign language study in a traditional classroom situation were compared to students who used programmed material covering the same content and attended small-group discussion sessions led by the instructor. Valdman

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[6]Wilbur S. Schramm, Research on programmed instruction: An annotated bibliography, (Washington, D.C.: U.S. Government Printing Office, 1964).

[7]R. A. Goldbreck et al., Integrating Programmed Instruction with Conventional Classroom Teaching, (San Mateo, California: American Institutes for Research, December, 1962).

[8]Albert Valdman, Programmed Instruction and Foreign Language Teaching (New York: McGraw-Hill Book Company, 1966), pp. 129-59.

concluded that students using programmed material and working with an instructor had a higher retention rate and better oral proficiency than students in traditional classes. Although no treatment was used which involved only the use of programmed materials, the significant aspect of this study would appear to be that students were working with the instructor in addition to using programmed materials.

The latter two studies are more specifically related to the experimental study of this paper and are deemed important since they provide evidence that programmed instruction and conventional instruction can be mutually facilitating.

## Discussion Groups

This section of the review of the literature is concerned with empirical research which presents three categories of research in terms of evaluative criteria. Three classes of research can be identified: (1) studies dealing with acquisition and retention of information, (2) studies that deal with group size in relation to effective communication, and (3) studies dealing with attitude change.

Haigh and Schmidt[9] in dealing with the relative effectiveness of teacher-centered and group-centered approaches found that acquisition of knowledge is independent of teaching method when grades are determined by knowledge acquisition. A study by Asch[10] was conducted when instruction

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[9]G. V. Haight and W. S. Schmidt, "The Learning of Subject Matter in Teacher-Centered and Group-Centered Classes," Journal of Educational Psychology, XLVII (1956), pp. 295-301.

[10]M. J. Asch, "Non-Directive Teaching in Psychology: An Experimental Study," Psychological Monogram, LXV, No. 4, (1951).

was received in teacher-centered and group-centered arrangements. The group-centered section was told to determine their own grades and that the final examination did not count. The teacher-centered section did significantly better on a final objective examination.

Several studies have been conducted on the effect of group discussion and attitudinal change. Bloom[11] suggests that the discussion centered approaches appear to be significantly superior to the lecture method of teaching in the development of the ability to evaluate, synthesize, draw inferences, perceive relationships, and make application of the material learned. Kelley and Pepitone's[12] findings show that group-centered instruction appears to give an advantage in intellectual matters and that interpersonal attitudes are improved significantly by this approach. Because of the nature of their measures, however, the validity of their findings are questionable.

## Group Size

Most of the research done on group size in relation to achievement gives no convincing evidence that size as such has been a significant determiner of achievement as measured. It may be inferred, however, that group size is important in that it allows other variables to have a greater or lesser effect.

R. F. Bales conducted experiments at Harvard which led to strong

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[11]Benjamin S. Bloom, Taxonomy of Educational Objectives, (New York: David McKay Company, Inc., 1956).

[12]H. Kelley and A. Pepitone, "An Evaluation of a College Course in Human Relations," Journal of Educational Psychology, XLIII, (1952), pp. 193-209.

conclusions in regard to group size:

> There seems to be a crucial point at seven. Below seven for the most part, each person in the group says at least something to each other person. In groups over seven the low participators tend to stop talking to each other and center their communications on the few top men. The tendencies toward centralization of communication seem to increase rather powerfully as size increases.[13]

Crowell[14] investigated groups and developed a matrix which matches the type of group to the number of persons that can optimally interact according to the group's task or needs. The size of groups range from a maximum of seven for a problem solving group to a maximum of twenty-five for an exploration group. His rationale for optimal size of study groups is based on Peace Corps volunteers who met in groups to relate aspects of their different towns. He found that groups of more than twelve were highly frustrated in not being able to contribute data and information they deemed to be of value to other group members as well as to the Peace Corps. He concluded that twelve was the maximum for a study group.

Mills[15] found that the difference between the participation of the most talkative and least talkative persons increased as the size of the group increased from three to ten members. Miller[16], in his study of the effects of size on decision-discussion, found a negative correlation between size and group cohesiveness. While a positive correlation existed between size and clique formation, increasing size had no effect

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[13] R. F. Bales, Interaction Process Analysis (Cambridge, Mass.: Addison-Wesley Press, 1950).

[14] Laura Crowell, Discussion, Method of Democracy (Chicago: Scott-Foresman, 1963), pp. 297-301.

[15] C. Wright Mills, The Power Elite (New York: Oxford University Press, 1957), p. 15.

[16] H. L. Miller, "Group Discussion--Specific or Panacea?," Etcetera: A Review of General Semantics, II, (1953).

on the quality or quantity of decisions in groups of from three to twenty.

In a study that measured the attitudes of students regarding their preference for instructional methods, Ashmus and Haight[17] report that students having past experience with both group and teacher-centered instruction expressed no significant preference for either. Those having no experience with group methods significantly preferred the teacher-lecture approach. In a study of adult discussion groups, Kaplan[18] found that participants in the discussion groups with less than average education desired strong, directive, leadership by the discussion leader. In contrast, the better educated individuals resented a leader who dominated the group.

The scarcity of empirical research in the area of group discussion as related to levels of achievement is somewhat surprising in view of the recent popularity of measurement instruments used in analyzing group interaction. It is the writer's opinion that the use of groups as an effective medium for learning will become more common as instruction becomes more student-centered rather than teacher-centered.

## Slides, Filmstrips, Audio-Tapes

This section of the review of the literature is concerned with those media and that research which appear to be specifically significant to the experiment of this paper.

Studies reviewed include those dealing with the effectiveness of self-instructional programs in relation to student achievement and those

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[17] M. Ashmus and G. V. Haight, "Some Factors Which May Be Associated with Student Choice," American Psychology, VIII, (1952), p. 247.

[18] Abbot Kaplan, Study-Discussion in the Liberal Arts (White Plains, New York: The Fund for Adult Education, 1960).

which involve discussion sessions which have been integrated into self-instructional programs.

Shemick[19] utilized 35mm slides and audio-tapes in the instruction of metal spinning. He found that subjects receiving instruction by means of this technique required less aid from the instructor, but they required more time, took more trials, and did not attain the performance quality attained by those students who participated in the more conventional approach.

Moeller,[20] in using 8mm film and audio-tape recordings, came up with similar results in teaching elementary engine lathe operation. In contrast to those findings, however, "Training In Business and Industry,"[21] found that the time required to train industrial assembly workers was reduced fifty percent when the training utilized color slides and tape recordings.

A study by Colwell[22] compared the effectiveness of students who were taught audiovisual equipment operation by conventional lecture-demonstration methods with students receiving the same content through self-instructional techniques. The self-instructional programs included

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[19]John Shemick, "Teaching a Skill by Machine," Industrial Arts and Vocational Education, LIV, (October, 1965), pp. 30-31.

[20]Carl Moeller, "Comparison of Selected A-V Methods in Teaching," Journal of Industrial Teacher Education, IV, (March, 1967), pp. 20-29.

[21]Training in Business and Industry, "Kodak Evolves Better Assembly Training," Training in Business and Industry, III, (August, 1966), pp. 35-37.

[22]Dell M. Cowell, "The Effectiveness of Self-Instructional Techniques in Teaching Selected Phases of an Introductory Course in Audio Visual Education," (unpublished dissertation, State University of South Dakota, 1963).

charts, photographs, 2" x 2" color slides, and magnetic audio-tapes. Students engaged in the self-instructional treatment were divided into two groups, one in which students could obtain assistance from an instructor and one in which no assistance was given by the instructor.

No significant difference was found between groups. Colwell concluded, however, that students could learn equipment operation equally as well through self-instructional as through conventional means of instruction with a significant reduction in training time.

Allred[23] used three methods of instruction in a study designed to evaluate self-instructional methods for teaching audiovisual equipment operation to undergraduate education majors. The three methods included a linear programmed-text method, a sound-filmstrip method, and a method in which a student, who had received individual instruction from the instructor, taught another student. The latter student then taught another student and the process was continued until every student in the group had received instruction from the "Each-one-Teach-one" method.

Allred concluded that the self-instructional methods were significantly better than the "Each-one-Teach-one" method. Although mean scores indicated no significant difference between the self-instructional methods, Allred concluded that students learned best from the programmed text method.

Popham[24] used three different treatments in his investigation of tape-slide programs. The first technique consisted of a written version of

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[23]J. D. Allred, A Study of the Comparative Effectiveness of Three Methods of Teaching the Operation of Selected Audio Visual Equipment (unpublished dissertation, University of Oklahoma, Norman, Oklahoma, 1967).

[24]James Popham, "Pictorial Embellishments in a Tape-Slide Instructional Program," AV Communication Review, XVII (Spring, 1969), pp. 28-35.

the content explored, the second consisted of an unembellished tape-slide version of the same content, and the third was a cartoon-embellished tape-slide version.

Over 100 graduate students, randomly selected, served as subjects for the research. Of the three programs, no significant differences were found in two. There was no consistent superiority, however, either at the cognitive or the affective level, favoring one of the three treatment conditions. Popham concluded that the results suggest that for similar topics and for similar learners, the cost of preparing embellished versions may not be justified.

Dworkin and Holden[25] compared the achievement of 120 graduate engineering students who were divided into two matched groups. One group was shown four 15-minute sound filmstrips, the other group was offered the same material by lecture in the conventional classroom. No significant difference was found in achievement. Forty percent of the students who viewed the filmstrips, however, indicated that they would have welcomed the opportunity to ask questions.

Kolmos[26] conducted a study in which two groups participated in a self-instructional program in descriptive statistics. Both groups received the information from slides accompanied by audio tapes, the only difference being that one group met once a week for a thirty minute period

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[25]Solomon Dworkin and Alan Holden, "An Experimental Evaluation of Sound Filmstrips vs. Classroom Lectures," AV Communication Review, VIII, (May-June, 1960), p. 157.

[26]Albert Kolmos, "Effects of Media on Teaching," (unpublished dissertation, College of Education, University of Illinois, Urbana, Illinois, 1970).

for interaction with the instructor. He states that: "The results lead to the conclusion that in a self-instructor confrontation and interaction, even at a minimal level, will raise test grades significantly."

Popham[27] conducted an experimental study which compared two instructional methods in a course in educational research. One group of students attended a traditional lecture class and engaged in instructor-led group discussion sessions. The other group received instruction through a series of audio tapes combined with instructor-led discussion sessions. No significant differences were found to occur between the two groups. The methods used in this study are questionable since Popham taught the lecture session and led the discussion sessions for both groups.

A similar and perhaps more valid study was conducted a year later in a course in secondary education. In this study Popham used student-led discussion sessions in both the tape-recorded and traditional lecture groups. This study also failed to indicate any significant differences between groups.

Paschall[28] conducted a study in which students who received self-instruction in the course "Audiovisual Materials in Teaching" were compared to students who received traditional instruction covering the same content. No significant difference between the two methods was found, indicating that students can learn the content of the course "Audiovisual Materials in Teaching" as well through self-instructional as through the traditional

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[27]James Popham, "Instructional Product Development: Two Approaches to Training," AV Communication Review, XVII (Spring, 1969), pp. 28-35.

[28]Jack Paschall, "The Comparative Effectiveness of Two Instructional Systems for Teaching the Course 'Audiovisual Materials In Teaching,'" (unpublished dissertation, 1970).

lecture-demonstration approach.

An important aspect of this study is that the self-instructional group received the content of an entire course by self-instructional means. Although a questionnaire at the end of the course indicated that students experienced difficulty with some of the concepts, no additional instructional assistance was given by the instructor. These findings are particularly significant to the experimental study of this paper since the same content is being used and the hypotheses were based on Paschall's findings.

Northcott and Woods[29] conducted a study in which students participated in both individual study programs and traditional classroom lectures in a course in economic geography. Carrels containing various mechanical devices were set up in the library for 200 first year students who had been divided into equal groups. The first group used the carrels until mid-semester when they were replaced by the second group, who had been attending lectures. During the semester each group experienced both learning situations.

One important aspect of this experiment is that when the first group had to leave the carrels they became discontented and it was estimated that as many as one third of the students returned to use the carrels when they could find a vacant place. It should also be noted that the quality and content of the lectures was not reported by the authors of this study.

Student attitude questionnaires revealed that 79 percent of the

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[29]P. H. Northcott and C. S. Woods, "An Audiovisual Innovation In Undergraduate Teaching," Audiovisual Instruction, (December, 1970, pp. 68-71.

students preferred carrels to lectures. A small percentage disliked the carrel method and stated that the voice on the tapes was monotonous, the pace too rapid, and the length of most programs too long.

The authors summarized the advantages of the carrel system as follows:

(1) The student proceeds at an individual pace;
(2) Data may be explored in greater depth;
(3) Closer integration of audio and visual materials is achieved;
(4) Visual and aural distractions are reduced;
(5) More student involvement in the learning process is encouraged;
(6) Revision and missed programs may be studied during vacations;
(7) Communication among staff is facilitated with resultant improvement in overall course structure.

Richason[30] conducted an experiment in which the audiovisual tutorial method of instruction was used to teach a beginning course in physical geography. Independent study carrels were set up in the AVT laboratory for use by over 200 students. The AVT laboratory was open five days a week for periods ranging from ten to fourteen hours per day. Students attended the course in physical geography. Independent study carrels were set up in the AVT laboratory for use by over 200 students. The AVT laboratory was open five days a week for periods ranging from ten to fourteen hours per day. Students attended the course on an unscheduled basis and studied the material at times most convenient to their schedules and interests.

Four discussion sessions were available weekly to provide students with an opportunity to meet with the instructor to ask questions or to discuss ideas in depth. Although attendance at these sessions was not

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[30]Benjamin F. Richason, "Teaching Geography by the Audiovisual Tutorial Method," Audiovisual Instruction (Washington, D.C.: Department of Audiovisual Instruction, February, 1970), pp. 41-44.

required, about half of the students attended.

Results of the AVT laboratory experiment were analyzed for a period of twelve semesters. Results show that about 40 percent more content material was covered in the audiotutorial approach than was previously covered in the conventional classroom approach. Scores on examinations increased 28.75 percent over a four-year period and the students spent an average of 3 hours 32 minutes per week in the AVT laboratory. Student attitudes were favorable toward the AVT approach with almost 50 percent indicating that it was the best course they had taken in college.

## Summary

Studies reviewed in this chapter were primarily concerned with comparing self-instructional programs--involving various instructional media--to traditional classroom teaching techniques. Most of these studies were concerned with only a segment of a particular course while two of the studies involved participation in which the content of an entire course was presented to students by self-instructional means.

Studies evaluating group discussion as a medium for learning were rather limited in scope. Several studies, however, were cited in which discussion groups were used as integral parts of self-instructional programs.

# CHAPTER III

## METHODOLOGY

The purpose of this experiment was to implement some of the concepts of an instructional systems approach and to test its effectiveness in teaching and learning. Specifically, the project was designed to determine the effectiveness of a self-instructional approach in the teaching of the basic audiovisual course at East Central State College in Ada, Oklahoma.

Procedures for the experiment included writing behavioral objectives based on the concepts contained in the content of the course, constructing the media to be used in the experiment, development and assignment of experimental treatments and preparation of the measuring instruments to be used in collecting data for the experiment. This chapter contains a description of those methods and procedures, beginning with background information concerning the development of the self-instructional units.

### Background of the Self-instructional Program

The self-instructional course "Audiovisual Methods in Teaching" was developed by a doctoral candidate at the University of Oklahoma for an experimental research project during the spring semester of 1970.[1] The self-

[1] Jack Paschall, "The Comparative Effectiveness of Two Instructional Systems for Teaching the Course 'Audiovisual Materials in Teaching'," (unpublished Doctoral Dissertation, The University of Oklahoma, Norman, Oklahoma, 1970).

instructional lessons consisted primarily of 35mm slides accompanied by audio-tapes. Approximately 650, 35mm slides were produced and coordinated with audio-tapes to form 24 self-instructional units. Various other instructional media, however, were integrated into the course periodically during the semester. These included video-tapes, 16mm sound motion pictures, 8mm continuous loop films, 35mm sound filmstrips and a linear programmed text. Reading assignments and miscellaneous activities were assigned to students through either the self-instructional lessons or through printed instructions.

The investigator of that experimental project compared the mean achievement scores of students in the self-instructional program with those receiving the same content taught by the traditional lecture-demonstration method. Research findings indicated that students learned as well from the self-instructional as from the traditional method.

During the summer of 1970 the self-instructional program was revised. This was accomplished by the investigator of the previously mentioned research project and a graduate assistant in the College of Education at the University of Oklahoma. Lessons, and segments of lessons, which had been presented to students by video-tapes, motion pictures, and loop films were converted to slide-tape units. This was accomplished by reviewing the scripts of those particular segments of the course and constructing the appropriate visuals. Slides were then taken of the visuals and the verbal content was transferred to audio-tapes. Approximately 30, 35mm slides were added to the self-instructional program as a result of this process.

Slides in all units of the course were then reviewed and those deemed as inappropriate or of poor quality were re-taken. Sixteen additional copies of each slide in the course were made to ensure that a minimum of 20 students

would be able to view, at all times, any unit in the program.

The revised program was tested as a pilot study on students enrolled in the course Audiovisual Methods in Teaching at the College of Education, University of Oklahoma, during the spring semester of 1971. After these students had attended the self-instructional course for one week it was decided that further revision of the program was necessary. The self-instructional units were reviewed to determine whether additional visual material was needed to clarify concepts presented in the various units. New visuals were added to the self-instructional units and some visuals were replaced because of poor visual quality or copyright problems.

A master script was produced which contained all the verbal content presented to the students on audio-tapes. The script was marked to indicate changes in the visual content and a graphic representation of each visual was placed in the margin of the script to indicate which visual was to be coordinated with a particular audio portion of the self-instructional program. A sample script is included in Appendix A.

The slides were incorporated into thirteen separate instructional units. A content outline of these units is included in Appendix B. The addition of new visual material necessitated re-narrating the audio portion of the course. An electronic audible pulse was placed on the audio-tape, which enabled the student to determine the appropriate time to manually advance the visual portion of the program to match the coordinated verbal information.

The decision was made to transfer the slide units to 35mm filmstrips in order to eliminate the possibility of misplacing individual slides and to increase the efficiency of storage.

## Development of Behavioral Objectives

Before conducting the experiment it was necessary to define, in behavioral terms, the objectives for the course. Since the content of the course had previously been established and produced in a mediated format, the objectives for the course were established retrospectively by reviewing the scripts of the self-instructional units. This involved an in-depth analysis of the content and served primarily as a guide in the preparation of an instrument designed to measure the effectiveness of the various treatments in the experiment. Bloom[2] and Mager[3] were used as references to aid in the preparation of these objectives, which are included in Appendix C.

## Instrumentation

Based on the previously determined behavioral objectives, an objective examination containing 176 items was constructed and validated by using 98 students who had completed the self-instructional course Audio-visual Methods in Teaching at East Central State College, Ada, Oklahoma.

An item analysis of test responses revealed that some items were lacking in discrimination. Using recommended procedures of the Educational Testing Service,[4] 18 items were eliminated from the test. The Kuder-Richardson Formula 20 revealed an estimate of the reliability of the test

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[2]Benjamin Bloom, Taxonomy of Educational Objectives (New York: David McKay Company, Inc., 1966).

[3]Robert Mager, Preparing Instructional Objectives (Palo Alto, California: Fearon Press, 1962).

[4]Short-cut Statistics for Teacher-made Tests (Evanston, Illinois, Educational Testing Service, 1964), pp. 26-33.

as .780. This was viewed as an acceptable level of reliability by the investigator.

The validation of the instrument was further refined by administering the remaining items to 30 students who had completed the self-instructional program in a "mini-course" between semesters at East Central State College. These students participated in self-instructional activities 6 hours per day for a period of 2 weeks. An item analysis of test responses revealed a higher level of discrimination between items than the first test. The Kuder-Richardson Formula 20 reliability estimate for the revised test was .81. The revised objective examination is included in Appendix D.

One aspect of the course required students to demonstrate a proficiency in the operation of selected audiovisual equipment. The students received instruction for equipment operation through the self-instructional units and from a programmed text.[5] The experimental treatments were not applied to this particular segment of the course since all students were required to practice equipment operation until they had mastered the operating procedures. A laboratory assistant used a prepared evaluation check-list for the different aspects of equipment operation. This check-list is included in Appendix E.

Although the objective examination was the primary tool in determining whether or not significant results were achieved, a questionnaire was devised in order to measure, to some extent, student attitude toward the course, the media, and the instructional methods employed. This instrument was validated by using students enrolled in the equivalent self-

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[5]J. D. Allred and W. R. Fulton, Programmed Text on the Operation of Selected Audio Visual Equipment (Norman, Oklahoma: College of Education, University of Oklahoma, 1969).

instructional course at the University of Oklahoma and is included in Appendix F.

## Conducting the Experiment

A total of 104 students were enrolled in the basic audiovisual course at East Central State College, Ada, Oklahoma. All students were enrolled in one of seven sections in which they were randomly assigned, by section, to participate in one of four treatments. Four students were dropped from the course within the first week and one student was added which left a total of 101 students to participate in the experiment.

During the first class session the instructor explained to the students the nature of the course and the experimental groups in which they would be involved. All students agreed to participate in the experiment. A pre-test was administered in order to determine whether significant differences existed between groups in knowledge of audiovisual methods and materials. The groups were then notified as to which group they had been randomly assigned. Conflicting class schedules presented a major problem in randomly assigning sections to participate in the large group discussion session. After evaluating the problem of grouping four sections for discussion purposes, it was determined that students enrolled in the 11:00 A.M., 12:00 P.M., and 1:00 P.M. sections would participate in the large group discussion session during the regularly scheduled class time of the 12:00 P.M. section. The major factor in this decision was the availability of a lecture room large enough to accomodate four class sections. The earliest time in which a room was consistently available for this purpose was 12:00 P.M., which also allowed students in the 11:00 A.M. and 1:00 P.M. sections time to obtain lunch during the time they normally would

have been in class. The 8:00 A.M., 9:00 A.M., 10:00 A.M. and 2:00 P.M. sections were then randomly assigned to participate in the various treatments.

The 8:00 A.M. section was assigned to participate in the instructional group which involved only the use of the self-instructional program. This method of instruction was designed to measure the effectiveness of the course as a self-instructional program and students were advised that no assistance would be given by the instructor. Achievement for this group was considered to be an adequate measure of the effectiveness of the self-instructional program. This group of 16 students served as the control group for the experiment and will be referred to as Group A. All other groups involved in the experiment were designed to determine whether or not students benefited from supplementary instructional assistance. The major variables were group size and the effect of student-led versus instructor-led discussion sessions.

Group B participated in instruction which involved the use of the self-instructional units supplemented by attendance at instructor-led, small group discussion sessions. Student achievement for Group B was thus a function of the self-instructional program plus additional time devoted to discussion topics and the variable of instructor personality during the discussion sessions. The discussion sessions were specifically designed to clarify misconceptions concerning the course content. The instructor made no attempt to summarize areas of the content and responded only to questions submitted by the students. This group contained 16 students enrolled in the 9:00 A.M. section of the course.

The 14 students enrolled in the 10:00 A.M. section of the course

were assigned to participate in Group C. These students received instruction through the use of the self-instructional units and participated in student-led group discussions. Student achievement resulting from this method was a function of the self-instructional program and the effect of knowledge transfer within the group during discussion sessions.

The remaining section, the 2:00 P.M. section, was placed in Group D. This group participated in instruction involving the use of the self-instructional units and participation in instructor-led, large group discussion sessions. As previously mentioned, the 11:00 A.M., 12:00 P.M., and 1:00 P.M. sections had been directly assigned to participate in this group. The major variable in this method, which involved 55 students, was group size. The instructor followed the same procedures discussed in relation to Group B that pertained to discussion techniques.

It should be noted that the discussion sessions for Groups B, C, and D occurred directly following selected units of instruction. A total of 8 discussion sessions were periodically conducted during the experiment. A topical outline of the self-instructional units and a breakdown of discussion sessions relating to those specific units is included in Appendix G. The eight discussion sessions applied at various points in the course will be referred to as treatment applications.

## Statistical Treatment

Grade-point averages were obtained in order to compare for homogeneity of variance between students in the four sections of the experiment. An analysis of variance of the grade-point data is included in Appendix H.

Scores on the pre-test administered to the students were used to

compare the four sections for homogeneity of achievement in the area of audiovisual methods. An analysis of variance of these data is included in Appendix I.

Raw scores on the final examination were used to determine whether significant differences existed between the mean scores of the students in the four groups. As previously mentioned, scores for each of the four groups were divided into eight separate units, based on points in the program where the experimental treatments had been applied. An analysis of variance was used for analysis of these data and, as for the GPA and pretest data, a 5 percent level was selected as being significant. The Sheffé method of multiple comparisons was applied to those units in which significant differences existed in order to determine which pairs of means within the group were significantly different. A discussion of this analysis is included in Chapter IV.

An analysis of variance was applied to the results obtained from questionnaires completed by the students in order to determine whether significant difference existed among the groups. A chi square test was used to determine whether significant differences existed between the first and second questions. A discussion of this and the above analysis is included in Chapter IV.

Correlated t tests were applied to the data of the mid-term and the first half of the final examination. This was done in order to determine whether retention of knowledge differed significantly between groups. An analysis of covariance was also applied to the same data to measure the effect of time in relation to the success of the treatments employed. Summary tables and a discussion of these analyses are included in Chapter IV.

# CHAPTER IV

## FINDINGS AND ANALYSIS

The general hypothesis for this study was that students who completed self-instructional units and engaged in discussion sessions would score significantly higher on objective tests than students who completed only the self-instructional units. In order to test the general hypothesis, three hypotheses were generated and four treatments were administered, one to each of four groups of students enrolled in the course Audiovisual Methods in Teaching.

A 140-item objective test was constructed by the investigator and the resulting scores were used to support or reject the hypotheses. Eight analyses of variance were computed, one for each segment of the final test where an experimental treatment had been applied. Significant F ratios revealed by analysis of variance were followed by an application of the Sheffé method of multiple comparisons. Table 1 summarizes the analysis of these data.

The results will be discussed in the order in which the hypotheses were stated in Chapter I. The first hypothesis was that students who completed a self-instructional unit and participate in a group discussion session will score significantly higher on achievement tests than students who complete only the self-instructional units. There is no evidence to

support this hypothesis. Students in groups B, C, and D, all of whom received supplementary instruction in the form of group discussion sessions, did not score significantly higher than group A, in which students participated only in the self-instructional units.

On the basis of this experiment it may be concluded that additional time spent on the same subject material will not aid students in achieving higher criterion test scores. Factors not controlled by the investigator may have affected the first treatments of the experiment, however, and a discussion of this will be included in a later paragraph.

The second hypothesis generated was that students who complete a self-instructional unit and participate in an instructor-led small group discussion session will score significantly higher on achievement tests than students who complete the self-instructional unit and engage in a student-led small group discussion session. Group B consisted of instruction involving the use of the self-instructional program and student-instructor interaction in the form of discussion sessions following the completion of selected self-instructional units. Group C differed only in the fact that the discussion sessions were student-led rather than instructor-led.

Of the 8 analyses of variance employed for the treatments, 6 failed to support the hypothesis indicating that student-led discussion sessions are equally as effective as instructor-led discussion sessions for certain content areas. An analysis of variance applied to data pertaining to treatments 1 and 6, however, supported the hypothesis that instructor-led group discussion sessions would raise test scores significantly. It is the opinion of the investigator that significant results for treatments 1 and 6 can be directly related to the type or level of learning involved in

these treatments. Consideration of this aspect is relegated to a later discussion.

The final hypothesis stated that students who complete a self-instructional unit and participate in an instructor-led small group discussion session will score significantly higher on achievement tests than students who complete the self-instructional unit and participate in an instructor-led large group discussion session. Again, 6 of the 8 analyses failed to support the hypothesis. The Sheffé test of multiple comparisons applied to the significant analysis of variance results for treatments 1 and 6 give support to the hypothesis. A discussion of these results will follow Table 1.

Hypotheses 2 and 3 generated some consistent statistical evidence that suggested an examination of the course content. Each item on the objective test had previously been analyzed and placed into one of four areas of the cognitive domain. Table 2 summarizes this content and includes the percentage of higher level learning objectives and F ratios for each of the treatments.

The significant results obtained in treatments 1 and 6 may be attributed to the greater percentage of higher level objectives measured in those units which supported the second hypothesis. Treatment 4, although not significant, also lends support to this interpretation. The exception to this analysis occurred in treatment 2, which involved questions pertaining to equipment operation. This area transcended into the psycho-motor domain of learning, however, and may well have been misinterpreted by the investigator.

This analysis suggests that learning associated with higher level objectives is more readily achieved through student-instructor interaction.

TABLE 1

SUMMARY TABLES FOR ANALYSIS OF VARIANCE OF SCORES RELATED TO TREATMENT APPLICATIONS

| Source of Variation | Sum of Squares | Degrees of Freedom | Variance Estimate | F |
|---|---|---|---|---|
| Between | 51.93 | 3 | 17.31 | 2.98 |
| Within | 563.18 | 97 | 5.81 | P < .05 |
| Total | 615.11 | 100 | | |

SHEFFÉ METHOD OF MULTIPLE COMPARISONS

| Comparison | F | F´ | Outcome |
|---|---|---|---|
| A vs. B | 2.56 | 8.10 | P > .05 |
| A vs. C | 1.64 | 8.10 | P > .05 |
| A vs. D | 3.67 | 8.10 | P > .05 |
| B vs. C | 8.59 | 8.10 | P < .05 |
| B vs. D | 15.66 | 8.10 | P < .05 |
| C vs. D | .44 | 8.10 | P > .05 |

SUMMARY TABLE FOR

2. ANALYSIS OF VARIANCE OF SCORES RELATED TO SECOND TREATMENT APPLICATION

| Source of Variation | Sum of Squares | Degrees of Freedom | Variance Estimate | F |
|---|---|---|---|---|
| Between | 27.49 | 3 | 9.16 | 1.53 |
| Within | 580.50 | 97 | 5.98 | P > .05 |
| Total | 607.99 | 100 | | |

SUMMARY TABLE FOR

3. ANALYSIS OF VARIANCE OF SCORES RELATED TO THIRD TREATMENT APPLICATION

| Source of Variation | Sum of Squares | Degrees of Freedom | Variance Estimate | F |
|---|---|---|---|---|
| Between | 24.72 | 3 | 8.24 | .59 |
| Within | 1,335.86 | 97 | 13.77 | P > .05 |
| Total | 1,360.58 | 100 | | |

SUMMARY TABLE FOR

4. ANALYSIS OF VARIANCE OF SCORES RELATED TO FOURTH TREATMENT APPLICATION

| Source of Variation | Sum of Squares | Degrees of Freedom | Variance Estimate | F |
|---|---|---|---|---|
| Between | 45.43 | 3 | 15.14 | 1.98 |
| Within | 744.36 | 97 | 7.66 | P > .05 |
| Total | 789.79 | 100 | | |

SUMMARY TABLE FOR

5. ANALYSIS OF VARIANCE OF SCORES RELATED TO FIFTH TREATMENT APPLICATION

| Source of Variation | Sum of Squares | Degrees of Freedom | Variance Estimate | F |
|---|---|---|---|---|
| Between | 8.10 | 3 | 2.7 | .54 |
| Within | 489.19 | 97 | 5.04 | P > .05 |
| Total | 497.29 | 100 | | |

SUMMARY TABLE FOR

6. ANALYSIS OF VARIANCE OF SCORES RELATED TO SIXTH TREATMENT APPLICATION

| Source of Variance | Sum of Squares | Degrees of Freedom | Variance Estimate | F |
|---|---|---|---|---|
| Between | 189.03 | 3 | 63.01 | 3.85 |
| Within | 1,589.13 | 97 | 16.38 | P < .05 |
| Total | 1,778.16 | 100 | | |

SHEFFÉ METHOD OF MULTIPLE COMPARISONS

| Comparison | F | F′ | Outcome |
|---|---|---|---|
| A vs. B | 5.28 | 8.10 | P > .05 |
| A vs. C | 1.40 | 8.10 | P > .05 |
| A vs. D | 2.70 | 8.10 | P > .05 |
| B vs. C | 11.32 | 8.10 | P < .05 |
| B vs. D | 20.16 | 8.10 | P < .05 |
| C vs. D | 1.20 | 8.10 | P > .05 |

SUMMARY TABLE FOR

7. ANALYSIS OF VARIANCE OF SCORES RELATED TO SEVENTH TREATMENT APPLICATION

| Source of Variance | Sum of Squares | Degrees of Freedom | Variance Estimate | F |
|---|---|---|---|---|
| Between | 5.30 | 3 | 1.77 | .63 |
| Within | 271.21 | 97 | 2.79 | P > .05 |
| Total | 276.51 | 100 | | |

SUMMARY TABLE FOR

8. ANALYSIS OF VARIANCE OF SCORES RELATED TO EIGHTH TREATMENT APPLICATION

| Source of Variation | Sum of Squares | Degrees of Freedom | Variance Estimate | F |
|---|---|---|---|---|
| Between | 2.57 | 3 | .86 | .38 |
| Within | 218.86 | 97 | 2.26 | P > .05 |
| Total | 221.43 | 100 | | |

TABLE 2

TYPE OF OBJECTIVES MEASURED

| Treatment | Knowledge | Analysis | Application | Evaluation | %HLO* | F |
|---|---|---|---|---|---|---|
| I | 13 | 11 | 2 | 2 | 54 | 2.98 |
| II | 12 | 1 | 0 | 0 | 7 | 1.53 |
| III | 22 | 0 | 0 | 2 | 8 | .59 |
| IV | 16 | 2 | 0 | 2 | 20 | 1.98 |
| V | 12 | 0 | 0 | 0 | 0 | .54 |
| VI | 20 | 4 | 0 | 4 | 29 | 3.85 |
| VII | 7 | 1 | 0 | 0 | 13 | .63 |
| VIII | 7 | 0 | 0 | 0 | 0 | .38 |

*%HLO = Percentage of Higher Level Objectives

This would account for the higher achievement level obtained by students interacting with the instructor as compared to student-led interaction sessions.

Approximately the same results occurred in relation to the third hypothesis. This hypothesis compared the mean scores of students in groups B and D, both of which experienced instructor-led interaction sessions. The difference between these groups was that one group, group D, was approximately four times as large as group B. Applied treatments 1 and 6 were again the only treatments to obtain significantly different results. It is the investigator's opinion that interaction was severely restricted by the size of the group, which allowed the same factors to work that were discussed in relation to the second hypothesis.

The absence of significant differences to support the first hypothesis was quite puzzling. During the first class meetings the control group was informed they could expect no assistance from the instructor pertaining to the course content, while the other groups were told they would meet with the instructor approximately one day a week for discussion. The Hawthorne effect may have been working within the control group during the first experimental treatment sessions. It may also be that the other treatments were slow in getting started yet after a few sessions produced better results.

In order to test for the latter effect, an overall analysis of variance was computed for the mid-term test. Table 3 summarizes the results of these data, which indicate that a significant difference exists at the .05 level. The Sheffé method of multiple comparisons was applied to the significant finding in order to determine which differences between means were significant. Groups A, B, and C all scored significantly higher on the

TABLE 3

SUMMARY TABLE FOR

OVERALL ANALYSIS OF VARIANCE FOR
MID-TERM TEST

| Source of Variation | Sum of Squares | Degrees of Freedom | Variance Estimate | F |
|---|---|---|---|---|
| Between | 688.59 | 3 | 229.53 | 4.15 |
| Within | 5,366.80 | 97 | 55.33 | P < .05 |
| Total | 6,055.39 | 100 | | |

SHEFFÉ METHOD OF MULTIPLE COMPARISONS

| Comparison | F | F′ | Outcome |
|---|---|---|---|
| A vs. B | .66 | 8.10 | P > .05 |
| A vs. C | 6.48 | 8.10 | P > .05 |
| A vs. D | 95.69 | 8.10 | P < .05 |
| B vs. C | 7.85 | 8.10 | P > .05 |
| B vs. D | 102.30 | 8.10 | P < .05 |
| C vs. D | 38.00 | 8.10 | P < .05 |

mid-term test than group D. A summary of this analysis is also included in Table 3.

The results obtained from the analysis of the mid-term test were used to predict the results of the last half of the final test. The first half of the final test was identical to the questions on the mid-term and will be discussed later. If the treatments remained constant the second half of the final examination should logically have resembled the significant differences that occurred during the mid-term test. The variable not controlled was time, which may have allowed students to adjust to the experimental methods. Table 4 summarizes the results of this analysis which indicate no significant differences in mean scores. This evidence supports the earlier statement that one or more methods may have been slow in getting started but following a period of adjustment resulted in increased student performance.

To further substantiate this statement an analysis of covariance was performed on the mid-term scores and the first half of the final test scores, the items being the same for both tests. By using mid-term scores as the covariate, this statistic was used to determine whether the comparisons were biased in initial analysis and whether the variable of time was, in effect, responsible for the resulting scores. Table 5 summarizes the data for this table. The low F ratio for this analysis indicates that most of the variation in the X means can be attributed to the influence of the uncontrolled variable.

## Analysis of Retention

Although this study did not concern itself specifically with an analysis between groups on the retention rate of items common to both

TABLE 4

ANALYSIS OF VARIANCE FOR SECOND HALF OF FINAL TEST

| Source of Variation | Sum of Squares | Degrees of Freedom | Variance Estimate | F |
|---|---|---|---|---|
| Between | 199.92 | 3 | 66.64 | 1.03 |
| Within | 6,273.32 | 97 | 64.67 | P > .05 |
| Total | 6,473.24 | 100 | | |

TABLE 5

ANALYSIS OF COVARIANCE FOR MID-TERM AND FINAL TESTS

| | Source of Variation | | |
|---|---|---|---|
| | Between | Within | Total |
| Sum of Squares: Y | 680.97 | 6,366.80 | 7,047.77 |
| Sum of Squares: X | 296.82 | 8,831.75 | 9,128.57 |
| Sum of Products: | 423.42 | 5,570.80 | 5,994.22 |
| Degrees of Freedom | 3 | 97 | 100 |
| Adjusted sum of squares: X | 84.33 | 3,957.43 | 4,041.76 |
| Degrees of freedom for adjusted sum of squares | 3 | 96 | 99 |
| Variance estimate | $Sb^2$=28.11 | $Sw^2$=41.22 | |
| | | | F = .68 |
| | | | P > .05 |

the mid-term and final examinations, a brief investigation of such a comparison was attempted. A t test for correlated samples was applied to the matched scores for individuals in all groups. Table 6 summarizes the results for each of the groups. Comparisons were made for questions which were divided into units after each treatment application.

In only one instance did results show that a significant difference occurred between responses to mid-term and final examinations. This occurrence involved students in the control group, treatment A, and involved the content area associated with the second treatment application-operation of audiovisual equipment.

In five instances negative correlations existed, indicating that students in those particular groups obtained, for identical items, higher scores on the final than on the mid-term examination. This would seem contradictory to expected results since the questions on the mid-term examination were not reviewed and a period of four weeks had elapsed between tests. The fact that 4 of the 5 negative correlations occurred in treatments in which student-instructor interaction sessions were present might suggest that questions concerning items on the mid-term test were directed to the instructor in discussion sessions following the mid-term test.

It is the investigator's opinion that other factors were responsible for this occurrence. First, 3 of the 5 negative correlations occurred in section D, the large group discussion session. An examination of the mid-term test data showed that the mean scores for this group were significantly lower than the other three groups. Logically, a regression effect should have taken place with higher as well as lower scores assuming normality toward the mean scores for all groups. It would also appear to be a logical conclusion to assume that students who received low scores on the

TABLE 6

SUMMARY OF CORRELATED t SCORES AND RETENTION PERCENTAGES FOR GROUPS

| | Treatment Unit I | | | |
|---|---|---|---|---|
| | A | B | C | D |
| t score | .70 | -.06 | .60 | -.12 |
| Retention rate | .97 | 1.03 | .97 | 1.01 |

| | Treatment Unit II | | | |
|---|---|---|---|---|
| | A | B | C | D |
| t score | 2.88* | .99 | 1.51 | -.22 |
| Retention rate | .90 | .95 | .88 | 1.01 |

| | Treatment Unit III | | | |
|---|---|---|---|---|
| | A | B | C | D |
| t score | 2.03 | 1.63 | .49 | .83 |
| Retention rate | .89 | .95 | .97 | .98 |

| | Treatment Unit IV | | | |
|---|---|---|---|---|
| | A | B | C | D |
| t score | .15 | .60 | -1.33 | -.94 |
| Retention rate | .98 | .97 | 1.07 | 1.03 |

*Significant at the .05 level, two-tailed test.

mid-term test would be more likely to consult their notes in preparation for the final comprehensive test.

## Analysis of Attitude Data

It is the investigator's opinion that student attitude toward any instructional approach can be an important factor in determining whether such an approach is appropriate and whether revisions and adjustments in instructional methods would increase instructional efficiency. In an attempt to measure student attitude in this study a questionnaire was devised and validated by using students enrolled in the equivalent course at the University of Oklahoma, Norman. A reliability coefficient of .86 was obtained for the instrument. It should be pointed out that students participating in the validation process had completed only half of the units in the program when they were asked to complete the questionnaire a second time. This would limit the validity of questions 2 and 7 which were designed to measure student attitude upon completion of the course.

To better insure that student attitudes would not be affected by the final examination, the questionnaires were completed by the students before the achievement test was administered. The questionnaires were completed anonymously, as well, to increase the reliability and validity of the answers.

Questionnaires were received from 98 of the 101 students enrolled in the course. Ten questionnaires had to be discarded, however, either because answers to all questions had not been completed or because students failed to indicate the section of the course in which they were enrolled. An analysis of variance was applied to each of the first 7 questions and the last three questions were subjectively analyzed. In order to use an

analysis of variance, an arbitrary weight of three was assigned to a favorable response, a weight of two for a neutral response, and a weight of one for a negative response.

The first question in the questionnaire was concerned with the student's initial reaction to the instructional methods used in the course. A summary of student responses and an analysis of variance of the weighted measures is included in Table 7. Results show that no significant differences in attitudes occurred. Collectively, 46 students regarded the methods as favorable, 34 were neutral and only 8 students stated unfavorable initial reactions to the instructional methods employed.

The second question dealt with the student's overall reactions to the instructional methods used in the course. No significant differences were found in student attitudes upon completion of the course. A summary of student responses and an analysis of variance for these data is included in Table 8.

A comparison between first reactions toward the course (Question 1) and overall reactions toward the course (Question 2) revealed a trend toward less favorable student attitudes at the completion of the course. Collectively, 46 students had first reactions which were favorable while the number of favorable overall reactions decreased to 42. Thirty-four neutral first reactions declined to 26 at the completion of the course while 8 initial unfavorable reactions increased to 20 at the completion of the course.

In order to determine more specifically where these changes occured a chi square test was applied to each of the 4 treatment sections of the study. Table 9 summarizes these data and indicates that the attitudes of students in section C were significantly different at the end of the course

TABLE 7

ANALYSIS OF QUESTIONNAIRE DATA

1. What were your first reactions to the instructional methods used to teach this course?

| Section | Favorable | Neutral | Unfavorable | |
|---|---|---|---|---|
| A | 7 | 9 | 0 | 16 |
| B | 7 | 6 | 2 | 15 |
| C | 10 | 4 | 0 | 14 |
| D | 22 | 15 | 6 | 43 |
| Total | 46 | 34 | 8 | 88 |

ANALYSIS OF VARIANCE FOR QUESTION I

| Source of Variation | Sum of Squares | Degrees of Freedom | Variance Estimate | F |
|---|---|---|---|---|
| Between | 1.41 | 3 | .47 | 1.09 |
| Within | 36.18 | 84 | .43 | P > .05 |
| Total | 37.59 | 87 | | |

TABLE 8

STUDENT RESPONSES TO QUESTION 2

2. What was your overall reaction to the instructional methods used to teach this course?

| Section | Favorable | Neutral | Unfavorable | |
|---|---|---|---|---|
| A | 9 | 4 | 3 | 16 |
| B | 6 | 5 | 4 | 15 |
| C | 6 | 3 | 5 | 14 |
| D | 20 | 15 | 7 | 43 |
| Total | 42 | 26 | 20 | 88 |

ANALYSIS OF VARIANCE FOR QUESTION 2

| Source of Variation | Sum of Squares | Degrees of Freedom | Variance Estimate | F |
|---|---|---|---|---|
| Between | .66 | 3 | .22 | .33 |
| Within | 55.33 | 84 | .66 | P > .05 |
| Total | 55.99 | 87 | | |

TABLE 9

COMPARISON OF STUDENT'S FIRST AND OVERALL REACTIONS TO INSTRUCTIONAL METHODS

| | Favorable | Neutral | Unfavorable |
|---|---|---|---|
| Section A | | | |
| First Reaction | 7 (8) | 9 (6.5) | 10 (1.5) 16 |
| Overall Reaction | 9 (8) | 4 (6.5) | 3 (1.5) 16 |
| | 16 | 13 | 13 32 |
| $X^2$ with 2 df = 5.50 | | P > .05 | |
| Section B | | | |
| First Reaction | 7 (6.5) | 6 (5.5) | 2 (3) 15 |
| Overall Reaction | 6 (6.5) | 5 (5.5) | 4 (3) 15 |
| | 13 | 11 | 6 30 |
| $X^2$ with 2 df = .92 | | P > .05 | |
| Section C | | | |
| First Reaction | 10 (8) | 4 (3.5) | 0 (2.5) 14 |
| Overall Reaction | 6 (8) | 3 (3.5) | 5 (2.5) 14 |
| | 16 | 7 | 5 28 |
| $X^2$ with 2 df = 8.70 | | P < .05 | |
| Section D | | | |
| First Reaction | 22 (21) | 15 (15) | 6 (7) 43 |
| Overall Reaction | 20 (21) | 15 (15) | 8 (7) 43 |
| | 42 | 30 | 14 86 |
| $X^2$ with 2 df = .39 | | P > .05 | |

than at the beginning. In other words, student attitudes toward the instructional methods used to teach the course were significantly less favorable at the completion of the course than were their initial attitudes regarding the same methods.

Student attitudes in section A were also less favorable at the completion of the course than at the beginning, though not at the .05 level of significance. The attitudes of students in sections B and D remained fairly constant throughout the course. This provides evidence that student-instructor interaction is of primary importance in maintaining favorable attitudes of students who have, perhaps, never been exposed to self-instructional teaching methods.

Students experiencing the four treatments reported results which indicated no significant differences in attitudes toward question 3. Results from the groups were quite homogeneous. Collectively, over 51 percent of the students stated they would advise others to participate in the course, 40 percent responded they would, with reservations, while 9 percent responded negatively.

Similar results were found in students' attitudes toward the instructional media used in the course. No significant differences existed among the groups in relation to question 4. Again, 50 percent of the students viewed the media as being "good," over 40 percent regarded the media as "fair," and the remaining 7 percent rated the media "poor."

An analysis of variance of the data for question 5 resulted in no significant differences in attitude toward the pace of the individual lessons. There was, however, more dissatisfaction among the four groups than had been present in the previous questions. While 43 percent of the students felt the pace of the lessons was about right, 48 percent felt the

pace to be either slow or fast at different points in the program. The remaining 8 percent rated the media either too fast or too slow.

Over 50 percent of the students indicated that the individual lessons were complete in themselves and there was no significant difference between attitudes of the students in the various groups.

Students were quite divided as to whether or not they felt they learned more, the same, or less than they would have learned from a more traditional approach to teaching the course. Thirty percent of the students responded that they probably learned more from the self-instructional approach, while 30 percent felt they learned less than they would have learned under a traditional lecture-demonstration approach. The remaining 40 percent indicated that they felt they learned approximately the same amount of content as would have been learned in a more traditional approach. Table 10 contains a summary of responses and an analysis of variance for questions 3, 4, 5, 6, and 7.

Questions 8, 9, and 10 were open-ended questions which solicited responses from the students pertaining to advantages and disadvantages of the methods employed, as well as suggestions that would improve a program of this nature.

Students in all groups were almost unanimous in stating that the greatest advantage of such a program was the opportunity for each student to proceed at his own pace. A majority of the students stated that lessons missed were easily made up and several students felt that note taking was greatly facilitated because of the ability to replay portions of the lessons.

A definite trend was noted in the disadvantages of the program, listed by the students. All but three students who participated in

TABLE 10

3. WOULD YOU ADVISE OTHERS TO PARTICIPATE IN THIS COURSE OR IN A COURSE THAT USED SIMILAR INSTRUCTIONAL METHODS?

| Section | Yes | Conditionally | No | Total |
|---|---|---|---|---|
| A | 9 | 7 | 0 | 16 |
| B | 6 | 8 | 1 | 15 |
| C | 8 | 5 | 1 | 14 |
| D | 22 | 16 | 5 | 43 |
| Total | 45 | 36 | 7 | 88 |

ANALYSIS OF VARIANCE FOR QUESTION 3

| Source of Variation | Sum of Squares | Degrees of Freedom | Variance Estimate | F |
|---|---|---|---|---|
| Between | .47 | 3 | .16 | .38 |
| Within | 35.12 | 84 | .42 | P > .05 |
| Total | 35.59 | 87 | | |

4. HOW WOULD YOU RATE THE INSTRUCTIONAL MEDIA USED IN THIS COURSE?

| Section | Good | Fair | Poor | Total |
|---|---|---|---|---|
| A | 6 | 10 | 0 | 16 |
| B | 8 | 5 | 1 | 15 |
| C | 9 | 3 | 2 | 14 |
| D | 20 | 20 | 3 | 43 |
| Total | 43 | 38 | 6 | 88 |

ANALYSIS OF VARIANCE FOR QUESTION 4

| Source of Variation | Sum of Squares | Degrees of Freedom | Variance Estimate | F |
|---|---|---|---|---|
| Between | .14 | 3 | .05 | .12 |
| Within | 35.13 | 84 | .42 | P > .05 |
| Total | 35.27 | 87 | | |

5. HOW WOULD YOU DESCRIBE THE PACE OF THE INDIVIDUAL LESSONS?

| Section | About Right | Sometimes fast Sometimes slow | Too fast Too slow | Total |
|---|---|---|---|---|
| A | 9 | 6 | 1 | 16 |
| B | 3 | 11 | 1 | 15 |
| C | 6 | 6 | 2 | 14 |
| D | 21 | 19 | 3 | 43 |
| Total | 39 | 42 | 7 | 88 |

ANALYSIS OF VARIANCE FOR QUESTION 5

| Source of Variation | Sum of Squares | Degrees of Freedom | Variance Estimate | F |
|---|---|---|---|---|
| Between | 1.31 | 3 | .44 | 1.54 |
| Within | 24.05 | 84 | .28 | P > .05 |
| Total | 25.36 | 87 | | |

6. WERE THE INDIVIDUAL LESSONS COMPLETE?

| Section | Yes | Sometimes yes Sometimes no | No | Total |
|---|---|---|---|---|
| A | 6 | 9 | 1 | 16 |
| B | 8 | 6 | 1 | 15 |
| C | 5 | 9 | 0 | 14 |
| D | 26 | 16 | 1 | 43 |
| Total | 45 | 40 | 3 | 88 |

ANALYSIS OF VARIANCE FOR QUESTION 6

| Source of Variation | Sum of Squares | Degrees of Freedom | Variance Estimate | F |
|---|---|---|---|---|
| Between | 1.10 | 3 | .37 | 1.12 |
| Within | 26.86 | 84 | .33 | P > .05 |
| Total | 27.96 | 87 | | |

7. DO YOU FEEL YOU LEARNED MORE FROM THIS TYPE INSTRUCTION THAN YOU WOULD HAVE LEARNED FROM THE MORE TRADITIONAL APPROACH?

| Section | Yes | About the Same | No | Total |
|---|---|---|---|---|
| A | 3 | 9 | 4 | 16 |
| B | 3 | 6 | 6 | 15 |
| C | 6 | 3 | 5 | 14 |
| D | 14 | 18 | 11 | 43 |
| Total | 26 | 36 | 26 | 88 |

ANALYSIS OF VARIANCE FOR QUESTION 7

| Source of Variation | Sum of Squares | Degrees of Freedom | Variance Estimate | F |
|---|---|---|---|---|
| Between | .94 | 3 | .31 | .51 |
| Within | 51.06 | 84 | .61 | P > .05 |
| Total | 52.00 | 87 | | |

groups A and C stated that the absence of the instructor was a definite limiting factor of this type program. The complaint which occurred most often from participants in groups B and D was also the lack of communication between students and instructor. This is somewhat surprising since students in these groups engaged in interaction sessions with the instructor approximately one day per week. Another disadvantage noted by all groups was that some of the lessons were quite boring and that students tended to procrastinate or were simply concerned with getting the lessons out of the way.

The pattern of suggestions for improving the course was closely related to the disadvantages previously mentioned. Students in sections A and C were overwhelmingly in favor of student-instructor interaction. Students in treatments B and D also made this suggestion but were more specific and several suggested that the instructor should review and discuss each lesson immediately following the self-instructional process. Other suggestions were made but none were common to many students. Some students expressed complete satisfaction with the course while others stated they would rather attend lectures.

# CHAPTER V

# CONCLUSIONS AND RECOMMENDATIONS

## Summary

The problem of this study was to determine the effectiveness of various discussion treatments on achievement scores of groups of students who received identical content through self-instructional means. The self-instructional program consisted of 35mm filmstrips accompanied by audio tapes. The general hypothesis for the study was that students utilizing the self-instructional material and participating in discussion sessions would score significantly higher on achievement tests than students who received only the self-instructional material.

Subjects for the study were one hundred one students enrolled in the course Audiovisual Methods in Teaching at East Central State College, Ada, Oklahoma. Group A participated in instruction which involved only the use of the self-instructional units; Group B participated in instruction which included the use of the self-instructional units and attendance at instructor-led small group discussion sessions; Group C participated in instruction involving the use of the self-instructional units and participation in student-led small group discussion sessions; Group D participated in instruction which included the use of the self-instructional units and participation in instructor-led large group discussion sessions.

Grade-point averages and pre-test scores of the students in the four sections were analyzed to insure homogeneity of variance among groups. No significant differences were indicated. Raw scores on a 140-item objective examination were used to determine whether significant differences existed in the mean scores of students in the four sections. An analysis of variance was the major statistical procedure used for this purpose.

## Findings

Hypothesis one: Students who complete a self-instructional unit and participate in a group discussion session will score significantly higher on achievement tests than students who complete only the self-instructional unit.

An analysis of the data failed to support the first hypothesis. Students who attended discussion sessions did not achieve significantly higher scores on the criterion test at the .05 level than did those students who received only the self-instructional content.

Hypothesis two: Students who complete a self-instructional unit and participate in an instructor-led small group discussion session will score significantly higher on achievement tests than students who complete the self-instructional unit and engage in a student-led small group discussion session.

Of the eight analyses of variance employed in analyzing these data, those associated with treatment applications 1 and 6 revealed significant differences at the .05 level. Analysis of the data for treatment applications 2, 3, 4, 5, 7 and 8 indicated no significant differences at the .05 level to support the second hypothesis.

Hypothesis three: Students who complete a self-instructional unit and participate in an instructor-led small group discussion session will score significantly higher on achievement tests than students who complete the self-instructional unit and participate in an instructor-led large group discussion session.

Treatment of the data revealed that 2 of the 8 analyses supported this hypothesis, being significant at the .05 level. Again, the significant differences obtained were from treatment applications 1 and 6 while the remaining 6 analyses failed to support the hypothesis.

## Conclusions

The study failed to establish that additional time devoted to the self-instructional material through group discussion sessions would effect any significant gains in achievement as measured by the criterion tests.

Significant differences at the .05 level for particular treatment applications revealed that student-led discussion sessions may be equally as effective as instructor-led discussions for achievement of the lower levels of the cognitive domain. Relatedly, student achievement is significantly increased by instructor presence in discussion sessions dealing with more abstract and higher level learning areas of the cognitive domain.

The significant differences obtained from results involving the instructor-led small group discussion sessions and the instructor-led large group discussion sessions indicated that opportunities for interaction between the students and the instructor were limited, due to the size of the large group, and accounted for the differences in the mean scores.

The high level of difference obtained between groups that experienced instructor interaction and those that experienced no instructor interaction strongly indicates that student-instructor contact is of vital importance in maintaining favorable attitudes of students toward self-instructional activities.

## Discussion

The lack of statistical evidence to support the first hypothesis is difficult to explain since additional time was spent by groups B, C, and D covering the same content, with groups B and D having opportunities to interact with the instructor of the course. In attempting to explain the lack of significant differences it should be pointed out that students in groups B and D showed some tendency to rely on the instructor for information dissemination while students in the control group appeared to be more conscientious in working with the self-instructional units. The discussion sessions were not designed to review the self-instructional units, however, and some students in treatments B and D seemed quite frustrated during the first treatment applications. Student-instructor interaction increased during later treatment applications.

Another explanation for no significant findings to support the first hypothesis may be that the content of the self-instructional units was of such a nature that discussion sessions were not beneficial in helping students achieve higher test scores.

The significant results obtained in analysis of the data associated with the second hypothesis led to an examination of the course content. An analysis of the test items revealed that a much larger percentage of the items for the two significantly different treatment applications, treatments

1 and 6, measured a higher level of learning than did the items for the remaining 6 treatments.

Significant differences existed in the same content areas between the groups compared in the third hypothesis. This may seem somewhat contradictory to the conclusions drawn in the second hypothesis since both groups engaged in instructor-led group discussion sessions. The difference between the groups compared in the third hypothesis was that group B contained 16 students while 55 students participated in the discussion sessions of group D. The investigator's opinion that interaction was restricted by the size led to the conclusion related to this hypothesis.

A chi square test was used to determine whether students' attitudes differed significantly at the end of the course from their initial reactions to the instructional methods employed to teach the course. Student attitudes in section C were significantly less favorable at the .05 level at the completion of the course than at the beginning. The attitudes of students in group A were less favorable at the completion of the course also, while the attitudes of students in sections B and D varied little between initial and overall reactions to the instructional methods used. The conclusion drawn, that student-instructor contact is of vital importance in maintaining favorable attitudes of self-instructional activities, is deemed important since it could be the determining factor in the success or failure in implementing such a program into a course or segments of a course.

## Implications for Instruction

Several implications for instruction are warranted from the results of this investigation. The advantages of the self-instructional program

that were listed by the participants are quite well accepted. The most common advantages listed were that students can progress at their own speed, the ability of the student to replay lessons in order to facilitate note-taking, and the overall flexibility of the program. In regard to this last advantage, it should be pointed out that a number of students stated they missed several class sessions, yet because of the self-instructional methods used they were able to accomplish course requirements with a minimum of inconvenience.

From the results of this study it is evident that a teacher who integrates discussion sessions into a self-instructional program can facilitate learning by adhering to the following suggestions: First, the frequency of student-instructor discussion sessions should be directly related to the type or level of learning contained in the program; Secondly, the frequency of student-instructor discussion sessions should be closely associated with students' attitudes toward the self-instructional procedures and decreased only when the instructor has determined that students can work independently without becoming frustrated; Finally, the teacher should strive to accommodate, in a discussion session, only that number of students in which all have the opportunity to participate in the discussion. Although this number will vary according to an instructor's ability and teaching load, the investigator believes this element is of prime importance if instruction is to be effectively maximized.

## Recommendations for Further Study

Students in all sections did better on knowledge items than items measuring higher types of learning while difficulty indices decreased as higher level objectives were measured. A more detailed and exhaustive

examination of these types of comparisons would appear worthy of future research.

It may be reasonable to assume that students who have had successful experiences in self-instructional programs in college will initiate such techniques when they enter the teaching field. This assumption could be the basis for further study.

Variations of this study would be appropriate for further research in order to measure other variables not taken into consideration. For instance, would students who are highly verbal achieve better results than students with low verbal ability? Would random selection of individual students affect the results? Finally, would having each section experience each treatment during the course produce consistent results?

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# APPENDIX A

# SAMPLE SCRIPT

SCRIPT FOR UNIT I

Unit Title: Historical Perspective

| Visuals | Narration |
| --- | --- |
| | (X) |
| "Historical Development of Educational Media" | You should now be looking at the title slide for this unit, which is Unit I, "Historical Development of Educational Media." |
| | Before you proceed, be sure your tape counter is set to 000, if you have not already done so. If you have to stop in the middle of a unit, you can take note of the numbers on the tape counter when you stop--this will help you quickly return to where you left off. (X) |
| Visual of Cave Man and Son | Throughout most of human history, learning has been by direct experience and by stories passed down from father to son. The tutorial process practiced in early history consisted primarily of the instruction of one student by one tutor who posed a series of questions to which the student responded. |

This system allowed the tutor to adapt the pace and sequence of instruction to the student's needs. The instructional materials used in this sytem were quite simple, consisting of only a slate or some crude demonstration device; otherwise teaching and learning were an oral transaction. Since that time, tutorial instruction, with its one to one teacher student ratio has gradually evolved into mass instruction in which one teacher interacts with many students. (X)

Visual of Teacher With Small Class Using Printed Material

Mass education really began when two or more families began to use the same tutor. The chalkboard and hornbook were his earliest instructional materials. Later, printed materials and textbooks in particular became widely available and made it possible for teachers to work with much larger groups. The inclusion of these materials into the instructional scheme have greatly affected American education as it exists today. (X)

Visual of Crowded School Building

In 1900 only 8% of our youth of high school age were enrolled in high school; in 1957, 87% were enrolled. This surge in the number of students has presented American educators with problems and challenges which are not found in any other educational system

in the world, for as the enrollment becomes greater, so does the range of abilities and experiences of the students. (X)

Visual of Confused Teacher

The problems of communicating in this situation are not simple, and educators must continually strive to meet this challenge if the dreams of American education are to become reality. Audiovisual materials are one of the things that can help teachers meet this challenge. This is the task with which this course is concerned. (X)

## The Historical Development of Audio-Visual Materials in Instruction

"Historical Development"

The use of audio-visual materials in instruction is a relatively new educational practice, while many of the underlying philosophies which support the use of audio-visual materials in instruction go back several centuries. These principles could not be applied prior to the technological revolution of the late 19th and 20th centuries. Therefore, audio-visual instruction is clearly a product of the 20th century. (X)

### The Infancy of Audio-Visual Media - 1900-1940

"1900-1940 Edison, Eastman, Marconi"

Shortly before the 20th century many of the technical wizards of the time such as Edison, Eastman, and Marconi were inventing

devices which were to revolutionize the world of communications. Although their inventions, such as the phonograph, radio, motion picture projector, and flexible photographic film, were not made with the educator in mind, a few educators were able to catch a glimpse of the potential of communication technology in instruction. (X)

"1900 Herman DeVry"

In 1900 the Hermon DeVry Company was founded as a commercial motion picture company and shortly thereafter began to supply slides and short reels of film for instructional use. (X)

1907 Bell and Howell and Victor Animatograph

Two other companies which were to prove extremely important in the history of instructional media were the Bell and Howell Company, founded in 1907, and the Victor animatograph company founded in 1910. These companies were soon followed by many others who either produced equipment for instructional use or collected films or lantern slides for use in schools. (X)

"Adaptations From Entertainment Devices"

It is important to keep in mind that the films used in schools during this period were not produced specifically for instruction, but were adaptations of films which had

been produced for either entertainment, government, or advertising purposes. (X)

"1905 St. Louis, Mo., Educational Museum"

During the early part of the century the first systematic attempts were made by schools to collect non-print instructional materials and make them available for teachers. In 1905 the St. Louis, Missouri, public schools opened the St. Louis Educational Museum to administer the storage and accession of realio, models, demonstration devices, maps, charts, pictures, and lantern slides. (X)

Visual of Horse and Wagon

Shortly thereafter, the museum acquired a horse and wagon which were used to deliver the instructional materials to the schools, when this was more appropriate and convenient than bringing the students to the museum. (X)

"Other School Systems"

Other educational museums were soon organized in Reading, Pennsylvania, and Cleveland, Ohio. Paul Saettler, in his book, A History of Instructional Technology has pointed out that although the educational museum had an optimistic beginning in the first part of the century, its importance has since declined, and it never became an integral, functioning part of instructional technology. (X)

While a number of companies and individuals were responsible for the development of the instructional motion picture, one company, the Society for Visual Education, Inc., was almost solely responsible for the introduction and development of the filmstrip as a teaching tool. SVE was founded in 1919 to produce instructional motion pictures specifically designed for school use. Despite the fact that they began with a large working capital and a group of prominent educators to serve as consultants, they failed financially after four years and the company was taken over by one of the employees who continued to operate it on a smaller scale. In 1923 the company introduced a filmstrip projector called the "Picturoll" projector and quickly became the leaders in the production and distribution of filmstrips and filmstrip projectors, a position they have maintained to the present day. (X)

"S V E Society for Visual Education"

It was during this period prior to World War II that the first professional organizations were formed, the first research conducted and the first college courses in audio-visual instruction were offered. Another noteworthy event which transpired

"Organization Research College Courses"

during this period was the birth and demise of instructional radio as an educational medium. (X)

"Educational Radio"

Educational radio jumped off to a fast start about 1925 and many colleges, universities, and public schools organized. (X)

"School of the Air"

"Schools of the Air." However, the producers, or educational radio broadcasters, did not research the strength and weaknesses of a purely auditory presentation (X) and relied primarily on the format of traditional classroom lectures for the radio lesson.

Visual of Sleeping Students

The poor programming which resulted from these practices, coupled with strict government regulation and competition from the strong commercial networks, had for all practical purposes killed instructional radio by 1935. (X)

"Failures Gadgets No Coordination"

Thus, we have seen that the first 40 years of instructional technology were filled with overwhelming failures, petty gadgeteering and what would seem to be a total lack of coordination and cooperation. Yet, it was from the basis laid by these pioneers, that instructional media has risen to its present status. (X)

## Growth from Necessity: The War Years 1940-1945

1940-1945

The beginning of World War II presented the United States with an educational and training task of a magnitude which has never been equalled. If this country was to survive, it had to find a way to transorm a peaceful, largely agrarian population into an efficient, effective war machine before it suffered military setbacks which would be insurmountable. Never before had so many people required training in such a short time. As one possible solution, the armed forces and industry turned to instructional technology. (X)

January, 1941 to June, 1945
U.S.O.E. Division of Visual Aids

In January of 1941, the United States Office of Education formed the Division of Visual Aids for war training to supervise and coordinate the production of the needed materials. Between that time and June, 1945, this office produced 457 visual aid units, which consisted of 457 sound motion picture films, 432 silent filmstrips, and 457 instructors' manuals. These units were involved with all three domains of human learning as they disseminated information or cognitive knowledge, developed psycho-motor skills, and developed attitudes in the affective domain. Although training films received most of the publicity. (X)

Other Media in the War Effort

Many other media were also used in the war training effort. Graphics such as diagrams, charts, posters, maps, graphs and cartoons were used extensively. (X)

Visual of Link Trainer

The Link Trainer--a flight simulator--was only one of many simulators used to create a realistic environment without the expense and danger of actual field training. Models and mock-ups also became standard tools of the military instructor. Lantern slides and filmstrips were used extensively, and the forerunners of both the overhead and opaque projectors were first used in World War II military training. Audio devices were used for a variety of purposes, the most significant of which was for teaching foreign languages. (X)

Military Instruction

The experiences gained during these war years were of the utmost importance to the future development of instructional media, because this extensive usage had established that these materials were more than toys or gadgets; they had proven themselves useful tools for a variety of instructional purposes, and could never again be as casually dismissed as before. (X)

## The Post War Period: 1945 to 1958

Post War Period

These years directly following the end of World War II were filled with disillusionment for those who had believed that the war-time level of utilization of audio-visual materials would transfer directly into civilian educational efforts. The primary reasons why this did not occur were: (X)

Pressing Facilities Needs:

(1) there had been practically no school buildings built or civilian instructional materials produced for almost five years, and the physical plants gained priority,

(2) the baby boom of World War II soon compounded the shortage of buildings and teachers.

Baby Boom

The years directly following the end of World War II did not witness the phenomenal growth in audio-visual usage which had been present during the war years, because other problems such as overcrowding gained priority over the production of new instructional materials. However, while the growth during these years was not spectacular, it was there, and several media forms were being developed which expanded the scope of available audio-visual experiences. (X)

Instructional T.V.

Firsts:
Iowa State - 1950
FCC Authority - 1952

The most notable of these post-war innovations was the development of instructional television. (X) Although the first station primarily concerned with educational programming had started broadcasting from Iowa State College in 1950, it was not until April, 1952, that the Federal Communications Commission cleared the path for non-commercial educational television stations. During the late 1950's and the 1960's these stations quickly appeared over the entire country, and by 1967 there were almost 150 stations affiliated with the National Educational Television network. (X)

Language Labs
Overhead Projector
Slide Projector
Tape Recorder

This post-war period saw many war-time training devices improved and adopted for civilian instruction. The electronic learning laboratory used for teaching foreign languages was a post-war development which grew directly from military experiences. Other devices such as overhead projectors, slide projectors, and tape recorders were made more portable and much easier to operate. This period of slow steady growth ended as abruptly as it had begun when Sputnik was placed in orbit in 1957. (X)

## A Period of Motivation: 1958 to Present

Sputnik
N.D.E.A.

In 1958 Congress passed the National Defense Education Act, which was only the first of several acts which allocated federal funds for education. The monies provided by these acts promoted the growth and utilization of audio-visual instructional materials in three ways. (X)

Purchase of Equipment and Materials

First, these monies made it possible for many of the poorer school districts to purchase needed audio-visual equipment and materials; (X)

Institutes

Second, certain of these acts funded institutes which provided teachers with training in the utilization of their newly acquired tools; and (X)

Research

Third, these acts gave financial support to educational research which tested the value of audio-visual materials in instruction and explored new methods of utilizing these materials for the optimal benefit to education. (X)

New Outlook

Out of these activities came a totally new outlook for the use of audio-visual materials in instruction. (X)

Audio-visual Aids vs. Instructional Systems

Since the earliest usage of these materials they had been considered as in-

structional aids or supplemental to other instructional materials. The fallacies of this philosophy were overwhelmingly repudiated by the experiences and research of the post-Sputnik era, and a new philosophy of totally integrating audio-visual materials with the other instructional activities began to emerge. (X)

Multi-media Approach

Another philosophical innovation rooted in this period is the cross-media or multi-media approach. Prior to this time even the strongest proponents of audio-visual materials had tended to band into little groups which favored the use of one particular media form over all others. In this fashion they categorized themselves as "film-men," "slide-men," "T-V men" and so forth. However, the research and experience of the present period have revealed that there is no one perfect medium, that each form has its distinct advantages and limitations, and therefore, the most effective utilization of instructional media can be achieved only by using that medium or combinations of media which is most suited for the task at hand. This approach is not simple, but involves a

complex decision to be made by the teacher, based on the characteristics of the concept to be taught and the characteristics of the learner. It is with this process that the next lesson is involved. (X)

End of Unit I

This is the end of Unit I.

# APPENDIX B

# CONTENT OUTLINE

CONTENT OUTLINE

Unit I. Historical Development of Educational Media
- A. Historical Perspective
- B. The Infancy of Audio-visual Materials--1900-1940
- C. Growth from Necessity, The War Years--1940-1945
- D. The Post War Period--1945-1958
- E. A Period of Motivation - 1958 to the Present

Unit II. Educational Basis for the Use of Educational Media
- A. Implications of Learning for Educational Media Usage
- B. Scientific vs. Traditional Points of View
- C. Verbalism vs. Direct Experiences
- D. Piaget's Stages of Development--Implications for Media
- E. The Communication Barriers
- F. Barriers to Process
- G. Media Use to Overcome Communication Barriers

Unit III. Operation and Maintenance of A/V Equipment
- A. Suggested Approach to Learning Equipment Operation
- B. Motion Picture Projectors
  1. Types and Formats
  2. Operating Principles
  3. Setting Up the Projector
  4. Threading
  5. Projection Tips
  6. Maintenance
  7. Rewind
- C. Other Media
  1. Audio Tape Recorder
  2. Filmstrip Projector

Unit IV. Motion Picture Films in Education
- A. Instructional Applications of Motion Picture Film
- B. Historical Development
- C. Innovations in Film Formats and Applications
- D. Research Basis for Film Usage
- E. Film Making Devices and Techniques
  1. Time Lapse
  2. Slow Motion
  3. Telephoto Photography

4. Micro and Macro Cinematography
5. Animation
6. Use of Color
7. Flashbacks

Unit V. Utilization of Audio-Visual Materials--
The Teacher Utilizes a Motion Picture Film
- A. Analysis of Class Needs
- B. Selection of Films
- C. Previewing
- D. Decisions about Film Use
- E. Class Preparation

Unit VI. Part 1: Selection and Utilization of Still Projected Media
- A. Values of Still Projected Media
- B. Selection of Still-Projected Media
- C. Utilization
- D. Types of Projected Still Media
  1. Two by Two Inch Slides and Filmstrips
  2. Micro-forms
  3. Opaque Projection
- E. Physical Characteristics and Operation of Slide and Filmstrip Projectors
- F. The Overhead Projector
- G. Tachistiscopic Devices

Unit VI. Part 2: Preparation of Still Projected Media
- A. Types of Overhead Transparencies
  1. Thermal
  2. Dry Photocopy
  3. Diazo
  4. Handmade
  5. Colorlift
- B. Pre-production Considerations
- C. General Production Principles and Practices
- D. Specific Steps Involved in Production of Each Type of Transparency
- E. Mounting Transparencies and Overlays

Unit VII. Pictorial and Other Graphic Materials
- A. Flat Pictures
  1. Selection of Prints for Classroom Use
  2. Utilization of Flat Pictures
  3. Display Techniques
  4. Storage and Filing
- B. Dry Mounting and Laminating
  1. Dry Mounting and Laminating
  2. How to Use a Dry Mount Press
- C. Graphics
  1. Charts
  2. Diagrams
  3. Graphs
  4. Cartoons

Unit VIII. Clingboards, Chalkboards, Bulletin Boards, and Posters.
- A. Clingboards
  - 1. Advantages and Applications
  - 2. Materials
  - 3. Utilization and Limitations
- B. Chalkboards
  - 1. Advantages and Limitations
  - 2. Materials
  - 3. Techniques for Getting the Most from the Chalkboard
- C. Bulletin Boards
  - 1. Uses of Bulletin Boards
  - 2. Planning, Designing and Developing Bulletin Boards
- D. Posters
  - 1. Characteristics of a Poster
  - 2. Uses of Posters

Unit IX. Maps, Globes and 3-D Materials
- A. Maps and Globes
  - 1. Information Available
  - 2. Advantages of Globes
  - 3. Criteria for Selection of Globes
  - 4. Advantages of Maps
  - 5. Types of Error in Maps
- B. 3-D Objects
  - 1. Models
  - 2. Mock-ups
  - 3. Dioramas
  - 4. Relia
  - 5. Principles for Utilization of 3-D Objects
  - 6. Sources of 3-D Materials

Unit X. Auditory Materials
- A. Forms of Audio Materials
- B. Tape Recordings
- C. Disc Recordings
- D. Radio
- E. Problems in Use of Auditory Materials

Unit XI. Television in Education
- A. The Development of the Medium of Television
- B. Types of Television: Commercial, Educational and Instructional
- C. Open vs. Closed Circuit
- D. Equipment for Instructional Television

Unit XII. Teaching Machines and Programmed Materials
- A. Teachers and Programs
- B. Procedures for Developing Programmed Materials
- C. Advantages and Limitations of Programmed Instruction
- D. Types of Programmed Instruction
- E. Modes of Presentation for Programmed Materials
- F. Computer Assisted Instruction

Unit XIII. Educational Media Center and Community Resources

A. The Genesis of Educational Media Centers
B. Functions and Structure of Media Centers
C. Community Resources as a Learning Tool
D. Excursions
E. Resource Persons

# APPENDIX C

## OBJECTIVES FOR COURSE UNITS

## UNIT I

1) For specific given inventions (i.e., the motion picture projector and flexible film base), the student should be able to correctly identify, from a list of names, two nineteenth century inventors whose inventions contributed to the communications revolution of the twentieth century.

2) The student should be able to correctly identify - from a list containing the names of several commercial organizations - the commercial organization that developed and produced the "filmstrip" as an instructional tool.

3) The student should be able to correctly identify - from a list of media - the medium associated with "schools of the air."

4) The student should be able to correctly identify - from a list of events - those historical events that enhanced the development and use of instructional media.

5) The student should be able to correctly identify - from a list of media - those media used in military instruction during World War II.

6) The student should be able to correctly identify - from a list of media - those types of media, developed in the post-world war II years, that were adaptations and improvements of training devices developed for instructional use during the war.

## UNIT II

1) The student will be able to correctly identify - from a list containing channels of communication - the two most commonly used channels of the communications process.

2) The student will be able to correctly identify - from a list of characteristics - the characteristic associated with the "formal discipline" theory of learning.

3) The student will be able to correctly identify - from a list of characteristics - the characteristic associated with the "association" theory of learning.

4) The student will be able to correctly identify - from a list of components - the components of the two-way communication model that are associated with specific processes of communications.

5) Given a situation in which only one channel of communication would be appropriate, the student will be able to correctly identify that channel from a list of communication channels.

UNIT III

1) Given particular functions of parts of motion picture projectors, the student will be able to correctly identify, from a list of components, the component of the mechanical system of the projector that is associated with a particular function.

2) Given particular functions of parts of motion picture projectors, the student will be able to correctly identify, from a list of components, the component of the optical system of the projector that is associated with a particular function.

3) Given particular functions of parts of motion picture projectors, the student will be able to correctly identify, from a list of components, the component of the sound system of the projector that is associated with a particular function.

4) The student will be able to correctly identify, from a list, the number of frames per second of 16 mm motion picture film that are shown on a 16 mm motion picture projector at sound and silent speeds.

5) Given a situation demanding the use of a specific tool, the student will be able to correctly identify, from a list of tools, the tool described in this unit that is to be used in preventive maintenance of the 16 mm motion picture projector for that situation.

6) Given particular characteristics of motion picture film, the student will be able to correctly identify, from a list containing the names of different types of motion picture film, the type of motion picture film associated with a particular characteristic.

7) The student will be able to demonstrate the correct procedures for setting up, threading, running, rewinding, and securing a 16 mm sound motion picture projector.

8) The student will be able to demonstrate the correct procedures for setting up, threading, recording, playing, rewinding and securing the Walensack audio-tape recorder.

9) The student will be able to demonstrate the correct procedures for setting up, threading, showing and securing a 35 mm filmstrip in a 35 mm filmstrip projector.

10) The student will be able to demonstrate the correct procedures for setting up and operating the switches and controls necessary for showing a 10 X 10 inch transparency on an overhead projector.

UNIT IV

1) The student will be able to correctly identify - from a list of advantages - the item that best represents an instructional advantage of classroom film utilization for a particular given instructional situation.

2) Given an instructional situation the student will be able to correctly identify - from a list of limitations - the item that best represents a limitation of classroom film utilization based on research findings.

3) Given a characteristic of motion picture photographic techniques the student will be able to correctly identify - from a list of photographic techniques - that technique which is associated with the given characteristic.

4) Given the inventions the student will be able to correctly identify - from a list of names - the names of two inventors who pioneered in the development of motion pictures.

5) Given an appropriate statement the student will be able to correctly identify - from a list of historical events - the major historical event that greatly enhanced the use of the motion picture film as an instructional tool.

6) Given an appropriate statement the student will be able to correctly identify - from a list of motion picture titles - the title of the first feature-length sound motion picture film.

7) Given an instructional situation the student will be able to correctly identify - from a list of steps - the most appropriate step a teacher should take in determining whether motion picture film is the appropriate medium to use in teaching a concept.

8) The student will be able to correctly identify - from a list of motion picture formats - the type of motion picture film used in single concept loop cartridges.

9) The student will be able to correctly identify - from a list of items - the item that best represents an advantage of rear screen projection.

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*Objectives (7), (8), (9), and (10) of Unit III are based on ininstruction received from a programmed text and practice sessions as well as instruction received from the sould-filmstrip presentation.

10) The student will be able to correctly identify - from a list of items - the item that best represents an available source for the selection of instructional films.

11) The student will be able to correctly identify - from a list of items - the item that best represents the major instructional advantages of super 8 motion picture film as compared to regular 8 motion picture film.

12) The student will be able to correctly identify - from a list of items - the item that best represents an instructional advantage of 35 mm motion picture film.

13) The student will be able to correctly identify - from a list of items - the item that best represents an instructional advantage of 16 mm motion picture film.

14) The student will be able to correctly identify - from a list of items - the item that best represents an instructional advantage of 8 mm motion picture film.

## UNIT V

1) Given an instructional situation the student will be able to correctly identify - from a list of items - the item that best represents the procedural steps, listed in this Unit, that a teacher should take in preparation for showing a motion picture film.

2) The student will be able to correctly identify - from a list of items - the item that best represents a rule the projectionist should follow in showing a motion picture film.

3) The student will be able to correctly identify - from a list of items - the item that best represents a principle of utilization for audiovisual materials that was presented in this unit.

4) The student will be able to write three follow-up activities, presented in this Unit, that are associated with motion picture film utilization.

## UNIT VI

### Part I, Reel I

### Selection and Utilization of Still Projected Media

1) The student will be able to correctly identify - from a list of items - the item that best represents a criterion that is essential

for determining whether or not still projected media should be used to present a concept.

2) The student will be able to correctly identify - from a list of items - the item that best represents a utilization technique of still projected media.

3) Given a characteristic of a particular type of transparency, the student will be able to correctly identify - from a list containing different types of transparencies - the item that contains the type of transparency generally associated with the given characteristic.

4) Given a characteristic of a particular type of opaque material the student will be able to correctly identify - from a list of items - the item that best represents the type of opaque material generally associated with the given characteristic.

5) Given a characteristic of a type of equipment used for projecting transparent still media, the student will be able to correctly identify - from a list of items - the item that best represents the type of equipment generally associated with the given characteristic.

6) Given a characteristic of a type of equipment used for projecting opaque materials, the student will be able to correctly identify - from a list of items - the item that best represents the type of equipment associated with the given characteristic.

7) Given a characteristic of an "overlay" transparency the student will be able to correctly identify - from a list of items - the item containing the words "overlay" transparency.

Part I, Reel II

8) The student will be able to correctly identify - from a list of items - the item that best represents an advantage of 2 X 2 inch transparencies.

9) The student will be able to correctly identify - from a list of items - the item that best represents an instructional advantage of 35 mm filmstrips.

10) The student will be able to correctly identify - from a list of items - the item that best represents a limitation of 35 mm filmstrips.

11) Given a definitive statement of the term "sound filmstrip," the student will be able to correctly identify - from a list of items - the item containing the term -- "sound filmstrip."

12) Given a definitive statement of the term "microforms," the student will be able to correctly identify - from a list of items - the item containing the term "microforms."

13) Given a characteristic of stereo slides the student will be able to correctly identify - from a list of items - the item containing the term "stereo slides."

Part II, Reel I

1) Given a method of 10 X 10 inch transparency production, the student will be able to correctly identify - from a list of items - the item that contains the type of 10 X 10 inch transparency that is associated with the given production method.

2) Given a type of 10 X 10 inch transparency production method, the student will be able to correctly identify - from a list of items - the item that best represents an instructional advantage of the given method of production.

3) The student will be able to correctly identify - from a list of items - the item that best represents types of drawing pens and pencils that are appropriate for producing handmade 10 X 10 inch transparencies.

4) The student will be able to correctly identify - from a list of items - the item that best represents the type of commercial paper that must be used for color-lift transparency production.

5) Given the necessary equipment and materials the student will be able to produce a handmade 10 X 10 inch transparency.

6) Given the necessary equipment and materials the student will be able to produce a thermal transparency.

7) Given the necessary equipment and materials the student will be able to produce a color-lift transparency.

Part II, Reel II

1) The student will be able to correctly identify - from a list of items - the item that represents the inside dimensions of an overhead transparency that has been mounted.

2) The student will be able to correctly identify - from a list of items - the item that best represents the size of type most appropriate for use on overhead transparencies.

3) Given an example of transparency production material, the student will be able to correctly identify - from a list of items - the item that best represents a transparency production method associated with the given material.

4) The student will be able to correctly identify - from a list of

items - the item that best represents the colored setting on the thermofax 3M Secretary Copier that is most appropriate for producing thermal transparencies.

5) The student will be able to correctly identify - from a list of items - the item that best represents the correct procedure for inserting notched thermal transparency film into the 3M Secretary Copier.

6) The student will be able to correctly identify - from a list of items - the item that best represents a method for conserving transparency film while attempting to find the correct setting for producing a thermal transparency.

UNIT VII

1) The student will be able to correctly identify - from a list of items - the item that best represents an advantage of flat picture utilization.

2) The student will be able to correctly identify - from a list of items - the item that best represents a utilization principle.

3) The student will be able to correctly identify - from a list of items - the item that best represents a technique, as stated in this unit, for displaying flat pictures.

4) The student will be able to correctly identify - from a list of items - the item that represents equipment and materials necessary to mount flat pictures using the heat-press method.

5) The student will be able to correctly identify - from a list of items - the item that represents the correct temperature at which the heat-press should be set for mounting flat pictures to posterboard.

6) The student will be able to correctly identify - from a list of items - the item that represents the correct temperature at which the heat press should be set for laminating a visual.

7) Given particular characteristics for different types of charts, the student will be able to correctly identify - from a list of items - the item which contains the name of the chart generally associated with the given characteristic.

8) Given particular characteristics of different types of graphs, the student will be able to correctly identify - from a list of items - the item which contains the name of the graph generally associated with the given characteristics

9) The student will be able to correctly identify - from a list of

items - the item that best represents a characteristic of good instructional cartoons as presented in this Unit.

UNIT VIII

1) Given a particular characteristic of bulletin boards, the student will be able to correctly identify - from a list of items - the item that represents a function of bulletin boards that is associated with the given characteristic.

2) The student will be able to correctly identify - from a list of items - the item that best represents a characteristic of a poster.

3) The student will be able to correctly identify - from a list of items - the items that best represent an instructional advantage of clingboards.

4) The student will be able to correctly identify - from a list of items - the item that represents the length of time, as presented in this Unit, that a bulletin board should be displayed.

5) The student will be able to correctly identify - from a list of items - the item that represents types of material commonly used for constructing clingboards.

6) The student will be able to correctly identify - from a list of items - the item that represents the major instructional advantage of using "hook n' loop" boards.

7) The student will be able to correctly identify - from a list of items - the item that represents an instructional advantage of using the chalkboard.

UNIT IX

1) The student will be able to correctly identify - from a list of items - the item that best represents criteria to be used for selecting globes to be used for instruction.

2) The student will be able to correctly identify - from a list of items - the item that represents the most appropriate diameter size of a globe that enables one to easily determine the scale of the globe.

3) The student will be able to correctly identify - from a list of items - the item that best represents an instructional advantage of globe usage.

4) The student will be able to correctly identify - from a list of items - the item that best represents an instructional advantage of flat maps.

5) The student will be able to correctly identify - from a list of items - the item that represents a model.

6) The student will be able to correctly identify - from a list of items - the item that represents a mock-up.

7) Given a characteristic of a model the student will be able to correctly identify - from a list of items - the item containing the term "model."

8) The student will be able to correctly identify - from a list of items - the item that represents a diorama.

## UNIT X

1) The student will be able to correctly identify - from a list of items - the item that best represents an instructional advantage of magnetic audio-tape recordings.

2) The student will be able to correctly identify - from a list of items - the item that best represents an advantage of disc recordings.

## UNIT XI

1) The student will be able to correctly identify - from a list of items - the item that represents the frequency range over which most commercial television programs are broadcast.

2) The student will be able to correctly identify - from a list of items - the item that represents the television transmission system that generally has the more restricted audience.

3) Given particular characteristics of types of television equipment used for broadcasting both commercial and instructional television programs, the student will be able to correctly identify - from a list of items - the item that represents the type of equipment generally associated with the given characteristic.

4) The student will be able to correctly identify - from a list of items - the item that represents the width of video tape that is required for television boradcasts that are governed by FCC regulations.

## UNIT XII

1) The student will be able to correctly identify - from a list of items - the item which represents, as stated in this Unit, the major advantage of programmed instruction.

2) The student will be able to correctly identify - from a list of items - the item that represents a function of the teacher who uses programmed instructional material.

3) The student will be able to correctly identify - from a list of items - the item that represents a procedure to be followed in developing programmed instructional material.

4) Given a type of programmed instruction format the student will be able to correctly identify - from a list of items - the item which contains the name of the person generally associated with developing the given format.

5) Given a characteristic of linear programmed instruction the student will be able to correctly identify - from a list of items - the item containing the term "linear."

6) Given a characteristic of the branching method of programmed instruction the student will be able to correctly identify - from a list of items - the item containing the term "branching."

UNIT XIII

1) Given job descriptions of media center personnel the student will be able to correctly identify - from a list - professional and paraprofessional media center personnel associated with the given job descriptions.

2) The student will be able to identify - from a list of items - the item that best represents an instructional advantage of utilizing community resources.

3) The student will be able to correctly identify - from a list of items - the item that best represents a criterion for determining whether or not a field trip is the appropriate instructional technique to be used for an instructional situation.

4) The student will be able to correctly identify - from a list of items - the item that best represents an appropriate follow-up activity to be used in conjunction with a field trip.

# APPENDIX D

## PRE-TEST, MID-TERM, AND

## FINAL EXAMINATION

1. Which company was primarily responsible for the development of the filmstrip as an educational tool?
   a. Bell and Howell
   b. Kodak
   c. Herman DeVry
   d. Society for Visual Education

2. Which historical event was most responsible for creating an interest in research and development of instructional aids?
   a. World War I
   b. World War II
   c. The 1929 depression
   d. Modular scheduling

3. The historical event primarily responsible for the establishment of the National Defense Education Act in 1958 was:
   a. The Korean War
   b. The cold war
   c. placement of Sputnik in orbit
   d. nuclear testing

4. A post-war technological development that originated from military instructional practices was:
   a. the link trainer
   b. sound filmstrips
   c. electronic language laboratories
   d. models

5. A modern instructional device greatly improved since World War II is the:
   a. model
   b. mock-up
   c. graph
   d. overhead projector

6. Memorization and drill is most characteristic of which of the following learning theories?
   a. mental discipline
   b. associationistic
   c. experimental
   d. Gestalt

7. Which practice implies a scientific approach to instruction?
   a. exploration
   b. identification
   c. problem solving
   d. all of the above

8. Which part of the communication model is most closely associated with encoding messages?
   a. sender
   b. channel
   c. receiver
   d. none of these

9. When the receiver gives the sender an indication of the success of the communication, this response is called:
   a. symbols
   b. channels
   c. reinforcement
   d. feedback

10. A psychological barrier which is inherently associated with the lecture method of teaching is:
    a. physical discomfort
    b. excessive verbalism
    c. daydreaming
    d. referent confusion

11. If the word "seahorse" causes a child to visualize a horse, he is experiencing:
    a. day-dreaming
    b. feedback
    c. referent confusion
    d. imperception

12. Which of Piaget's learning stages is characterized by individuals who are able to visualize highly abstract concepts?
    a. pre-operational
    b. post-operational
    c. formal operational
    d. concrete operational

13. Which communication channel is more appropriate for an instructional task that requires an intermittent return to material previously covered?
    a. oral (face to face)
    b. oral (audio-tape)
    c. print
    d. visual-verbal (slide-tape)

14. Multi-channel presentations are most effectively used when:
    a. the channels are properly integrated
    b. the concept to be learned is highly abstract
    c. the level of maturity of the learner is low
    d. all of the above

15. Lenses should always be cleaned with:
    a. soft cloth
    b. carbon tetrachloride
    c. lint-free lens paper
    d. lint-free chamois

16. Which of the following affects the synchronization between the sound and picture on a sound motion picture?
    a. exciter lamp
    b. tone control
    c. lower loop
    d. sound drum

17. Which motion picture film size is most commonly used in education?
    a. 8mm
    b. 16mm
    c. 35mm
    d. 70mm

18. At what speed are silent 16mm films projected?
    a. 8 frames per second
    b. 16 frames per second
    c. 24 frames per second
    d. 32 frames per second

19. Tape-recorders erase automatically when?
    a. rewinding
    b. recording
    c. playing
    d. in fast forward

20. The most suitable method for erasing tape quickly, is by:
    a. an alcohol solution
    b. running through the recorder on fast forward
    c. an electro-magnet
    d. all of these

21. Which of the following is the most suitable instrument for removing hard deposits from the pressure plate of a projector?
    a. a pocket knife
    b. a wire brush
    c. a wooden toothpick
    d. a straightened paperclip

22. According to research note-taking during films is likely to be:
    a. detrimental
    b. beneficial
    c. of no consequence either way
    d. none of these

23. Which of these is an advantage of super 8mm over 16mm?
    a. better color film
    b. larger picture area
    c. quieter operation
    d. more economical

24. Which of these motion picture techniques makes action which occurs too slowly for observation more easily observed?
    a. time-lapse
    b. flash-back
    c. slow motion
    d. animation

25. Which of these motion picture techniques is used to represent a return to an earlier time?
    a. a time-lapse
    b. flash-back
    c. slow motion
    d. animation

26. Which of the following is not a good practice in the utilization of instructional films?
    a. showing only part of a film
    b. using a film as an introduction to other activities
    c. leaving the lights on to facilitate note-taking
    d. all of the above

27. Which item represents the historical event that had the greatest effect on the use of motion picture films as an instructional tool?
    a. National Secondary School Act of 1965
    b. National Defense Education Act of 1958
    c. World War II
    d. Sputnik

28. The inventor of the flexible film base was?
    a. Thomas Edison
    b. Varney Arnspiger
    c. Oleg Kodak
    d. George Eastman

29. Which is the most appropriate question a teacher should consider in determining whether or not a motion picture film is the correct medium to use for teaching a particular concept?
    a. is the film available
    b. is the film interesting
    c. does the concept require motion
    d. is the film expensive

30. A major advantage of rear screen projection is:
    a. the wide viewing angle
    b. it is condusive to note-taking
    c. it reduces the need for room darkening
    d. the use of mirrors

31. Which of these may be used to clinch a film presentation?
    a. class discussion of the film
    b. an oral quiz
    c. written reports from other sources on the film's subject
    d. all of the above

32. A teacher must be knowledgible in several areas to effectively utilize audiovisual materials. Which item best represents an area in which the teacher should have a basic understanding?
    a. a variety of instructional methods
    b. availability of educational media
    c. the concepts being taught
    d. all of the above

33. Which item best represents a valid criterion for selecting still-projected media to present a concept?
    a. materials are easier to find
    b. projection techniques are simple
    c. motion is not essential to the concept
    d. the concept is a visual one

34. Although all are transparencies in the broad sense, which of these sizes is most often referred to as a transparency?
    a. 2 x 2
    b. 2 1/4 x 2 1/4
    c. 3 1/4 x 4
    d. 10 x 10

35. A 10x10 inch transparency is often referred to as:
    a. a super slide
    b. a hand-made transparency
    c. an overhead transparency
    d. a lantern slide

36. Which of these allows group viewing of microscope slides?
    a. a microfiche
    b. micro-cards
    c. micro-film
    d. micro-projection

37. Which piece of equipment is most often used to project single-frame transparent images?
    a. carousel projector
    b. overhead projector
    c. film-strip projector
    d. micro-projector

38. Transparent material which uses hinges to allow for progressive presentation is commonly called:
    a. progressive disclosure
    b. a hinged transparency
    c. an overlay transparency
    d. a multi-media transparency

39. Which item represents an advantage of 2x2 slides?
    a. they have larger format than filmstrips
    b. they are more easily stored than filmstrips
    c. they are less expensive than filmstrips
    d. they are easily produced by teachers

40. Which item represents the best medium for sequential rearrangement?
    a. filmstrips
    b. 2 x 2 slides
    c. motion pictures
    d. sound filmstrips

41. A disadvantage of 35mm filmstrips is:
    a. they are too expensive
    b. they are easily lost
    c. they are easily damaged
    d. all of the above

42. Small film formats which contain large amounts of information are generally called:
    a. microforms
    b. microscope slides
    c. microplates
    d. condensed slides

43. A practice commonly associated with the scientific approach to instruction is:
    a. one-way communication
    b. teacher centered
    c. verbal communication
    d. reinforcement

44. Which part of the communication model is most closely associated with decoding messages?
    a. sender
    b. channel
    c. receiver
    d. none of these

45. The sender can then give approval, corrections, or additional information. This is called:
    a. symbols
    b. channels
    c. reinforcement
    d. feedback

46. Which psychological barrier is caused by the learner using a faulty frame of reference?
    a. physical discomfort
    b. excessive verbalism
    c. daydreaming
    d. referent confusion

47. Which of these barriers to communication is often a product of the others listed?
    a. physical discomfort
    b. excessive verbalism
    c. daydreaming
    d. none of these

48. Which of Piaget's learning stages is characterized by individuals who can understand observed processes yet lack the ability to understand the same processes when related through more abstract symbols?
    a. pre-operational
    b. concrete operational
    c. formal operational
    d. pre-formal operational

49. Which communication channel is more appropriate for an instructional task that requires overt reinforcement and feedback to clarify understanding?
    a. verbal (audio-tape)
    b. visual verbal (instructional television)
    c. verbal(programmed instruction)
    d. verbal (face to face)

50. Which of the following functions primarily as a shock absorber on a motion picture projector?
    a. feed sprocket
    b. upper loop
    c. pressure plate
    d. lower loop

51. When referring to motion picture film, 16mm refers to the:
    a. speed
    b. width
    c. length of the film
    d. thickness of the film

52. At what speed are sound 16mm films projected?
    a. 8 frames per second
    b. 16 frames per second
    c. 24 frames per second
    d. 32 frames per second

53. Which tape recording speed is more suited for recording music?
    a. 1 7/8 ips
    b. 3 3/4 ips
    c. 7 1/2 ips
    d. no difference

54. Which of the following is the most suitable instrument for cleaning dust and lint from the aperture?
    a. a wooden toothpick
    b. pipe cleaner
    c. pocket knife
    d. tweezers

55. Which would you not check if a projector fails to produce a picture?
    a. projection lamp
    b. exciter lamp
    c. power cord
    d. classroom circuit breaker

56. According to research the use of color in films:
    a. is necessary to most concepts
    b. aids social understanding
    c. is more beneficial
    d. none of these

57. Which of these factors cause super 8 films to be a significant improvement over regular 8mm?
    a. better color film
    b. larger picture area
    c. quieter operation
    d. more economical

58. Which of these motion picture techniques make action that occurs too quickly for observation more easily observed?
    a. time-lapse
    b. flash-back
    c. slow motion
    d. animation

59. Which of these motion picture techniques can be used to visualize an invisible process?
    a. time-lapse
    b. slow motion
    c. flash-back
    d. animation

60. Which of these techniques is used to make extremely small objects more visible?
    a. animation
    b. tele-photo photography
    c. micro-photography
    d. slow motion

61. Which item represents the historical event that had the greatest effect on the use of motion picture film as an instructional tool?
    a. National Secondary School Act of 1965
    b. National Defense Education Act of 1965
    c. World War II
    d. Sputnik

62. Which of the following is not a good practice in the utilization of instructional films?
    a. showing only part of a film
    b. using a film as an introduction to other activities
    c. leaving the lights on to facilitate note-taking
    d. all of the above

63. The man who invented the kineoscope was:
    a. George Eastman
    b. Thomas Edison
    c. Varney Arnspiger
    d. none of the above

64. The first feature length sound motion picture was:
    a. The Great Train Robbery
    b. Toll of the Sea
    c. The Al Jolson Story
    d. The Jazz Singer

65. Which item represents the type of motion picture film commonly used in single-concept loop cartridges?
    a. 8mm
    b. 16mm
    c. super 8mm
    d. A & C

66. Which of these has proven especially beneficial in how-to-do-it films?
    a. close-up photography
    b. micro-photography
    c. time-lapse action
    d. stop-action

67. A teacher must be knowledgible in several areas to effectively utilize audiovisual materials, which item best represents an area in which teacher should have a basic understanding?
    a. standardized tests
    b. I Q scores
    c. learning theory
    d. individual differences

68. Which item is not an example of good motion picture projection techniques?
    a. fading the volume when the film ends
    b. gradually increasing the volume when the picture begins
    c. darkening the room before starting the projector
    d. rewinding the film immediately after showing it.

69. Which item represents the best utilization technique for still projected media?
    a. follow-up activities
    b. a knowledge of composition
    c. skill in running audiovisual equipment
    d. flexible pacing

70. Which item represents the best criterion for selecting still projected media to present a concept?
    a. a combination of still projected media is better than any single type
    b. it is an effective means of communicating factual information
    c. materials are highly available
    d. A & C

71. Which of these is used primarily to facilitate information storage?
    a. micro-film
    b. micro-projection
    c. film-strips
    d. 2x2 slides

72. Which slide size is sometimes referred to as a lantern slide?
    a. 35mm
    b. 126
    c. 3 1/4 x 4
    d. 127

73. Material which reflects rather than allowing light to pass through it is called:
    a. refraction material
    b. translucent material
    c. mirror image material
    d. opaque material

74. Which piece of equipment does not use film?
    a. carousel projector
    b. filmstrip projector
    c. micro-projector
    d. micro-fiche viewer

75. A major advantage of 2x2 slides is?
    a. they are less expensive than filmstrips
    b. they have smaller format than filmstrips
    c. the sequence of pictures can be more readily changed than filmstrips
    d. they are easier stored than filmstrips

76. Which of the following is not an appropriate use for filmstrips?
    a. to provide a basis for understanding symbols
    b. to help teach skills
    c. to show motion
    d. to focus group attention

77. Filmstrips which are accompanied by records are called:
    a. slide-tapes
    b. visual recordings
    c. sound filmstrips
    d. viewgraphs

78. Slides which require specially designed glasses in order to view them are called:
    a. bi-optical slides
    b. stereo albums
    c. stereoviewers
    d. stereo slides

79. The text material on an overhead transparency master should not exceed:
    a. 10x10 inches
    b. 7 1/2 x 9 1/2 inches
    c. 8 1/2 x 11 inches
    d. 11 x 14 inches

80. Which process requires masters that contain a high carbon content?
    a. thermal
    b. Diazo
    c. dry photo-copy
    d. color-lift

81. Which of these usually will not reproduce on a thermal transparency?
    a. India ink
    b. ball point pen
    c. soft lead pencil
    d. electrographic pencil

82. Which item represents an advantage of thermal transparencies?
    a. They can be produced from inks with a high carbon content
    b. Multiple copies are easily produced
    c. Masters can be made from colored pencils
    d. They look more professional than transparencies made by other methods.

83. Which item represents a type of drawing material that is appropriate for producing handmade transparencies?
    a. grease pencils
    b. felt tip pens
    c. marsh pens
    d. all of the above

84. Which of the following are criteria for selecting flat pictures for educational purposes?
    a. clarity
    b. truthfulness
    c. suitability to the teaching concept
    d. all of the above.

85. Which of these is usually preferable when using flat pictures for instructional purposes?
    a. rapid inspectio- of many prints
    b. thoughtful study of a few prints
    c. they are equally sound practices
    d. neither is a sound practice

86. A suitable material for displaying photographic prints without damaging the print is:
    a. straight pin
    b. thumb tacks
    c. glue
    d. an easel

87. Which of these materials is not used in dry mounting?
    a. rubber cement
    b. poster board
    c. dry-mount tissue
    d. butcher paper

88. Which material is used in dry mounting a flat picture?
    a. laminating film
    b. dry-mount tissue
    c. dry-mount glue
    d. contact paper

89. Which item represents the correct temperature setting of the heat press for laminating a visual?
    a. 250
    b. 225
    c. 270
    d. 280

90. A type of graph that is useful for plotting trends is the:
    a. bar graph
    b. line graph
    c. circle graph
    d. pie graph

91. Which of these represents a function of bulletin boards?
    a. they facilitate study of single copy materials
    b. they stimulate student interest
    c. they create an atmosphere conducive to learning
    d. all of the above

92. Captions used to draw the reader closer in order to present additional information is a characteristic of which of the following:
    a. posters
    b. bulletin boards
    c. magnetic boards
    d. clingboards

93. Hook and loop boards are particularly advantageous for use with:
    a. flannel cut-outs
    b. magnetic materials
    c. heavier objects
    d. none of these

94. Which item represents an advantage of clingboards?
    a. inexpensive
    b. highly visual
    c. sequential development
    d. all of the above

95. A disadvantage of globe usage for instructional use is:
    a. accuracy
    b. simplicity
    c. color
    d. bulkiness

96. Which item represents an advantage of flat maps?
    a. they depict small portions of the earth's surface
    b. they depict the total surface of the earth
    c. portability
    d. all of the above

97. What do we call three dimensional representations of real things which do not necessarily look like the object being represented?
    a. copies
    b. models
    c. mock-ups
    d. specimen

98. Which of these items represents the most realistic instructional materials?
    a. globes
    b. dioramas
    c. models
    d. mock-ups

99. A major advantage of disc recordings as compared to audio-tape recordings is:
    a. they are non-erasable
    b. they use capstan drive
    c. they are more easily operated
    d. they are commercially produced

100. Most broadcast educational television stations receive some programs from:
    a. NBC
    b. FCC
    c. NET
    d. NRA

101. A device which allows visual images to be recorded and played back at future times is the:
    a. multiplexer
    b. vidicon camera
    c. synchronizer
    d. videotape recorder

102. Which item represents a function of the teacher who utilizes programmed instruction?
    a. motivation
    b. guidance
    c. coordination
    d. all of the above

103. The person generally credited with initiating the development of the branching approach to programming is:
   a. Crowder
   b. Pressey
   c. Skinner
   d. Green

104. There are several procedures to be followed when developing programmed instructional materials. Which item best represents one of those?
   a. determine whether the the program reduces failure
   b. determine the speed at which learning occurs
   c. determine the objectives of the instructional situation
   d. determine the cost of developing program

105. Which communications medium was used by schools of the air?
   a. motion picture film
   b. radio
   c. television
   d. all of the above

106. A simulator developed and used in military training during World War II was the:
   a. computer
   b. parachute simulator
   c. drivers simulator
   d. link trainer

107. Which item represents a medium that was not used for instructional purposes during World War II?
   a. motion picture film
   b. filmstrip
   c. television
   d. mock-ups

108. A modern educational device improved and made more portable since World War II is the:
   a. slide projector
   b. tape recorder
   c. overhead projector
   d. all of the above

109. The most notable instructional innovation since World War II is:
   a. cinemascope
   b. instructional television
   c. sound filmstrips
   d. language labs

110. Which of these senses is used more often in instructional situations:
   a. vision
   b. hearing
   c. touch
   d. taste

111. Which of the following theories implies forced learning:
   a. behavioristic
   b. Gestalt
   c. mental discipline
   d. associationistic

112. Which type size is preferable for use on transparencies intended for general classroom use?
   a. pica
   b. elite
   c. primary
   d. all are equally acceptable

113. A translucent master is necessary for producing which type of transparency?
   a. Diazo
   b. thermal
   c. color-lift
   d. dry-photo-copy

114. Transparencies produced by the dry photo-copy method are developed by?
   a. heat
   b. ammonia fumes
   c. photographic chemicals
   d. light

115. Which color setting is appropriate for producing thermal transparencies?
   a. red
   b. white
   c. green
   d. buff

116. Which of these practices can save transparency film?
   a. the use of test strips
   b. running the machine faster than usual
   c. running the machine more slowly than usual
   d. none of the above

117. Which item represents an advantage of handmade transparencies?
   a. they can be produced quickly
   b. they are informal
   c. they are less likely to be ruined in storage
   d. multiple copies can be made quickly

118. Which item represents an advantage of the color-lift method of transparency production?
   a. color transparencies can be made from pictures in certain magazines
   b. they do not require the use of transparent film
   c. they require little time to produce
   d. they have a professional appearance

119. Which of these is not a principle for the effective use of flat pictures?
   a. use few rather than many pictures
   b. integrate pictures with the lesson
   c. the color rather than black and white pictures
   d. use pictures for specific purposes

120. Which of these is most available to classroom teachers?
   a. filmstrips
   b. mock-ups
   c. flat pictures
   d. motion picture films

121. Which of these processes is the least messy?
   a. wet-mounting
   b. dry-mounting
   c. rubber cement-mounting
   d. they are equally messy

122. Before laminating, flimsy materials should be:
   a. soaked in hardening solution
   b. washed with vinegar
   c. dry-mounted
   d. none of these

123. Which item represents the correct temperature setting for the dry-mounting process
   a. 250
   b. 270
   c. 225
   d. 265

124. Good instructional cartoons have three characteristics. Which item more nearly represents one of these characteristics?
   a. they must use highly abstract symbols
   b. they must be funny
   c. they must be appropriate for the experience level of the student
   d. they must be satirical in nature

125. Dramatic simplicity is a characteristic of which of the following:
   a. clingboards
   b. chalkboards
   c. bulletin boards
   d. posters

126. Which of these is not characteristic of a good poster?
   a. simplicity
   b. attractiveness
   c. multi-purpose
   d. a brief text

127. Which item represents an advantage of clingboards?
   a. content is easily manipulated
   b. students prefer three dimensional materials
   c. students enjoy making the instructional material
   d. A and B

128. The most important factor that enables students to distinguish features on globes is:
   a. latitude lines
   b. lettering
   c. color
   d. embossed surfaces

129. Distance is easier to estimate on which size globe?
   a. 12 inch
   b. 16 inch
   c. 18 inch
   d. 36 inch

130. The globe is an example of which of these?
   a. diorama
   b. simulation
   c. mock-up
   d. model

131. What are recognizable three-dimensional representations of real things called?
   a. copies
   b. models
   c. mock-ups
   d. specimen

132. Which item represents a type of audio material not commonly used without accompanying visual material?
   a. radio
   b. optical sound recordings
   c. disc recordings
   d. magnetic tape recordings

133. Which item represents a major advantage of audio-tape recordings as compared to disc recordings?
   a. they are more easily stored
   b. they are less expensive
   c. they are more available
   d. they are more easily produced by teachers.

134. Most broadcast TV programs are transmitted over which frequency range?
   a. UHF
   b. AM-FM
   c. FCC
   d. VHF

135. A device which allows 2x2 inch slides, filmstrips, and motion picture film to be projected into a TV camera is a:
   a. video-tape recorder
   b. image-orthocon viewer
   c. vidicon viewer
   d. multiplexer

136. Which size videotape must be used for television programs broadcasting under FCC regulations?
   a. one inch
   b. two inch
   c. one-half inch
   d. all of the above

137. A major advantage of programmed instruction is that it can be used to:
   a. teach foreign languages
   b. disseminate information
   c. motivate students
   d. solve complex problems

138. Branching programs usually utilize:
   a. a constructed response
   b. a multiple choice response
   c. a true-false response
   d. a written response

139. The most valid criticism levied against current programmed learning materials is:
   a. they don't allow students to move at varying speeds
   b. they are too verbal
   c. they are too complicated for practical use
   d. they are too concentrated

140. A professional media specialist who works primarily with printed materials is generally called:
   a. an audiovisual specialist
   b. a media technician
   c. a librarian
   d. a clerk

# APPENDIX E

## EVALUATIVE CHECK-LIST FOR

## EQUIPMENT OPERATION

NAME_____

16MM Projector

_____Threading
_____Focus
_____Elevation
_____Framer
_____Motor Switch
_____Lamp Switch
_____Volume Control
_____Tune Control
_____Locate Proj. Lamp
_____Locate Exc. Lamp
_____Rewinding

Tape Recorder

_____Threading
_____Record
_____Playback
_____Change Speeds
_____Set Program Indicator
_____Tone Control

Other

_____Loading or Threading
_____Focus
_____Framing if applicable
_____Elevation
_____Lamp Location

_____SCORE

TESTED BY_____

# APPENDIX F

# ATTITUDE QUESTIONNAIRE

QUESTIONNAIRE

1. What were your first reactions to the instructional methods used to teach this course?

   Favorable_____ Neutral_____ Unfavorable_____

2. What was your overall reaction to the instructional methods used to teach this course?

   Favorable_____ Neutral_____ Unfavorable_____

3. Would you advise others to participate in this course or in a course that used similar instructional methods?

   Yes_____ Conditionally_____ No_____

4. How would you rate the instructional media used in this course?

   Good_____ Fair_____ Poor_____

5. How would you describe the pace of the individual lessons?

   About Right_____ Sometimes Fast Too Fast
   Sometimes Slow_____Too Slow_____

6. Were the individual lessons complete?

   Yes_____ Sometimes Yes No_____
   Sometimes No _____

7. Do you feel that you learned more from this type instruction than you would have learned from the more traditional approach?

   Yes_____ About the same_____ No_____

8. What advantages do you see in this type of program?

9. What disadvantages do you see in this type of program?

10. What suggestions do you have for improving this type of program?

# APPENDIX G

# TOPICAL OUTLINE AND

# TREATMENT APPLICATIONS

Unit I. Historical Development of Educational Media

Unit II. Educational Basis for the use of Educational Media

First Treatment Application

Unit III. Operation and Maintenance of Audiovisual Equipment

Second Treatment Application

Unit IV. Motion Picture Films in Education

Unit V. Utilization of Audio-Visual Materials --
The Teacher Utilizes a Motion Picture Film

Third Treatment Application

Unit VI. Part I: Selection and Utilization of Still Projected Media

Fourth Treatment Application

Unit VI. Part II: Preparation of Still Projected Media

Fifth Treatment Application

Unit VII. Pictorial and Other Graphic Materials

Unit VIII. Clingboards, Chalkboards, Bulletin Boards and Posters

Unit IX. Maps, Globes, and 3-D Materials

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Sixth Treatment Application

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Unit X. Auditory Materials

Unit XI. Television in Education

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Seventh Treatment Application

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Unit XII. Teaching Machines and Programmed Materials

Unit XIII. Educational Media Center and Community Resources

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Eighth Treatment Application

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# APPENDIX H

## SUMMARY TABLE OF ANALYSIS OF VARIANCE OF GRADE POINT DATA

ANALYSIS OF VARIANCE OF
GRADE-POINT AVERAGES

| Sum of Squares | | | | |
|---|---|---|---|---|
| Between | 774.62 | - | 774.22 | = .40 |
| Within | 792.07 | - | 774.62 | = 17.45 |
| Total | 792.07 | - | 774.22 | = 17.85 |

| Source of Variance | Sum of Squares | Degrees of Freedom | Variance Estimate |
|---|---|---|---|
| Between | .40 | 3 | .13 |
| Within | 17.45 | 97 | .18 |
| Total | 17.85 | 100 | F = .72 |

P > .05

# APPENDIX I

## SUMMARY TABLES OF ANALYSES OF VARIANCE OF PRE-TEST DATA BY TREATMENT UNITS

ANALYSIS OF VARIANCE OF PRE-TEST DATA
FOR TREATMENT UNIT I

| Sum of Squares | | | | |
|---|---|---|---|---|
| Between | 12,434.28 | - | 12,346.84 | = 87.44 |
| Within | 13,586.00 | - | 12,434.28 | = 1,151.72 |
| Total | 13,586.00 | - | 12,346.84 | = 1,239.16 |

| Source of Variation | Sum of Squares | Degrees of Freedom | Variance Estimate |
|---|---|---|---|
| Between | 87.44 | 3 | 20.14 |
| Within | 1,151.72 | 94 | 12.46 |
| Total | 1,239.16 | 97 | F = 2.32 |

P > .05

ANALYSIS OF VARIANCE OF PRE-TEST DATA
FOR TREATMENT UNIT II

| Sum of Squares | | | | |
|---|---|---|---|---|
| Between | 2,884.37 | - | 2,877.15 | = 7.22 |
| Within | 3,231.00 | - | 2,884.37 | = 346.63 |
| Total | 3,231.00 | - | 2,877.15 | = 353.85 |

| Source of Variation | Sum of Squares | Degrees of Freedom | Variance Estimates |
|---|---|---|---|
| Between | 7.22 | 3 | 2.41 |
| Within | 346.63 | 94 | 3.69 |
| Total | 353.85 | 97 | F = .65 |

P > .05

ANALYSIS OF VARIANCE OF PRE-TEST DATA
FOR TREATMENT UNIT III

| Sum of Squares | | | | |
|---|---|---|---|---|
| Between | 8,824.61 | - | 8,787.59 | = 37.02 |
| Within | 9,646.00 | - | 8,824.61 | = 821.39 |
| Total | 9,646.00 | - | 8,787.59 | = 858.41 |

| Source of Variation | Sum of Squares | Degrees of Freedom | Variance Estimate |
|---|---|---|---|
| Between | 37.02 | 3 | 12.34 |
| Within | 821.39 | 94 | 8.74 |
| Total | 858.41 | 97 | F = 1.41 |

P > .05

ANALYSIS OF VARIANCE OF PRE-TEST DATA
FOR TREATMENT UNIT IV

| Sum of Squares | | | | |
|---|---|---|---|---|
| Between | 6,971.12 | - | 6,945.15 | = 25.97 |
| Within | 7,423.00 | - | 6,971.12 | = 451.88 |
| Total | 7,423.00 | - | 6,945.15 | = 477.85 |

| Source of Variation | Sum of Squares | Degrees of Freedom | Variance Estimate |
|---|---|---|---|
| Between | 25.97 | 3 | 8.66 |
| Within | 451.88 | 94 | 4.91 |
| Total | 477.85 | 97 | F = 1.96 |

P > .05

ANALYSIS OF VARIANCE OF PRE-TEST DATA
FOR TREATMENT UNIT V

| Sum of Squares | | | | |
|---|---|---|---|---|
| Between | 1,426.70 | - | 1,419.68 | = 7.02 |
| Within | 1,643.00 | - | 1,426.70 | = 216.30 |
| Total | 1,643.00 | - | 1,419.68 | = 223.32 |

| Source of Variation | Sum of Squares | Degrees of Freedom | Variance Estimate |
|---|---|---|---|
| Between | 7.02 | 3 | 2.34 |
| Within | 216.30 | 94 | 2.30 |
| Total | 223.32 | 97 | F = 1.01 |

P > .05

ANALYSIS OF VARIANCE OF PRE-TEST DATA
FOR TREATMENT UNIT VI

| Sum of Squares | | | | |
|---|---|---|---|---|
| Between | 9,334.97 | - | 9,325.88 | = 9.08 |
| Within | 10,364.00 | - | 9,334.97 | = 1,029.03 |
| Total | 10,364.00 | - | 9,325.88 | = 1,038.11 |

| Source of Variation | Sum of Squares | Degrees of Freedom | Variance Estimate |
|---|---|---|---|
| Between | 9.08 | 3 | 3.03 |
| Within | 1,029.03 | 94 | 10.95 |
| Total | 1,029.03 | 97 | F = .28 |

P > .05

ANALYSIS OF VARIANCE OF PRE-TEST DATA
FOR TREATMENT UNIT VII

| Sum of Squares | | | | |
|---|---|---|---|---|
| Between | 813.09 | - | 811.47 | = 1.62 |
| Within | 1,011.00 | - | 813.09 | = 197.91 |
| Total | 1,011.00 | - | 811.47 | = 199.53 |

| Source of Variation | Sum of Squares | Degrees of Freedom | Variance Estimate |
|---|---|---|---|
| Between | 1.62 | 3 | .54 |
| Within | 197.91 | 94 | 2.11 |
| Total | 199.53 | 97 | F = .26 |

P > .05

ANALYSIS OF VARIANCE OF PRE-TEST DATA
FOR TREATMENT UNIT VIII

| Sum of Squares | | | | |
|---|---|---|---|---|
| Between | 489.12 | - | 484.94 | = 4.18 |
| Within | 603.00 | - | 489.12 | = 113.88 |
| Total | 603.00 | - | 484.94 | = 118.06 |

| Source of Variation | Sum of Squares | Degrees of Freedom | Variance Estimate |
|---|---|---|---|
| Between | 4.18 | 3 | 1.39 |
| Within | 113.88 | 94 | 1.21 |
| Total | 118.06 | 97 | F = 1.16 |

P > .05