AN ABSTRACT OF THE THESIS OF

RONALD DEAN SCHOESLER (Name) for the DOCTOR OF EDUCATION (Degree)

in BUSINESS EDUCATION (Major) presented on April 30, 1970 (Date)

Title: THE DEVELOPMENT OF NEW INSTRUCTIONAL MEDIA FOR THE OFFSET DUPLICATING PROCESS UTILIZING THE AUDISCAN SYSTEM

Abstract approved: Redacted for Privacy
Dr. Theo. C. Yerian

The research study discussed and amplified in this paper consisted of the development and evaluation of two instructional concepts illustrating the procedures for 1) typing an offset master, and 2) duplicating offset copies. Each concept was prepared for use with the Audiscan projector, which utilizes a 16mm continuous loop filmstrip and synchronized sound tape. The medium requires individual student performance and participation.

The study was designed to determine whether students using the Audiscan (the experimental groups) could master the two concepts without assistance from an instructor and whether they could complete the required performance activities more efficiently than students not using the Audiscan (the control groups). Two experimental and two control groups were selected from a Business Machines and

an Office Procedures class at Oregon State University.

Results of testing indicated that the experimental groups did complete the required performance tasks without the aid of the instructor. Evaluation factors indicate that the experimental groups were measurably higher in all categories evaluated. In addition, the attitude of the students in the experimental groups was highly favorable; they preferred the use of the Audiscan and its self-contained concepts to the traditional lecture/demonstration presentation.

The development of concepts for the Audiscan by the writer of this study demonstrates that it is possible for a classroom instructor to prepare instructional materials of this type at a minimal cost, provided adequate facilities and technical assistance are available within the institution. If it is necessary to rely upon commercial firms for assistance in production, the costs can become prohibitive.

The Development and Evaluation of New Instructional Media for the Offset Duplicating Process Utilizing the Audiscan System

by

Ronald Dean Schoesler

A THESIS

submitted to

Oregon State University

in partial fulfillment of
the requirements for the
degree of

Doctor of Education

June 1971

APPROVED:

Redacted for Privacy

Professor and Chairman of Department of Business Education
in charge of major

Redacted for Privacy

Dean of Graduate School

Date thesis is presented April 30, 1971

Typed by Donna L. Olson for Ronald Dean Schoesler

ACKNOWLEDGEMENTS

The writer is particularly indebted to the personnel of the Instructional Resources and Materials Center at Oregon State University for their assistance in filming and developing numerous slides. Thanks go to Mr. Ben Purvis, Mr. Bert Sperling, and Mr. Ted Rosenbalm.

The writer expresses appreciation to Mr. Bill Stafford of Finzer Business Machines for the loan of offset duplicating equipment. Appreciation is also extended to Mr. Robert Duhrkoop of Audiscan Incorporated for his technical assistance and advice in preparing the cartridge films.

Acknowledgement is also extended to Mr. Ken Warren and his staff of Instructional Materials and Equipment Services. Their assistance in the final stages of the processing provided the necessary elements which were so critical to the project.

Gratitude is expressed to Dr. Theo. C. Yerian for his encouragement and sound words of wisdom and advice. A special thanks to Mrs. Mary Lou McPheeters for her invaluable assistance in planning the media for the research project and to the many office administration students in my class who participated in various ways throughout the past two years.

TABLE OF CONTENTS

Chapter | Page

LIST OF TABLES

LIST OF ILLUSTRATIONS

THE DEVELOPMENT OF NEW INSTRUCTIONAL MEDIA FOR THE OFFSET DUPLICATING PROCESS UTILIZING THE AUDISCAN SYSTEM

CHAPTER I

INTRODUCTION

New instructional media need to be developed around a systems design to improve instruction in office procedures. The improved instructional media are essential to advancing the quality of instruction by the elimination of repetitive teaching of basic functions. Quality instruction should be made available to allow the student to learn from instructional concepts at any given moment, and to review these concepts for reinforcement, when necessary. The instructor must utilize his time more effectively in meeting the individual needs and goals of the student.

Teaching methods have been relatively stable for a number of years and few innovations have been successfully implemented in institutions of higher learning. While reform of teaching methods in higher education has often been talked about, seldom has any action been taken that can be noticed in the classroom, with the exception of educational television, although it has been used more for convenience in the lecture hall than for innovative teaching.

A number of conditions that call for improvements exist in higher education in the areas of teaching methods and subject content. One factor causing this need is the number of students demanding entrance into higher education from all social and economic levels in our society. The increasing numbers are putting a strain upon the institutions of higher learning. This is particularly true of the expanding community colleges. A second factor is the demand for relevant subject matter and for better teaching methods of that subject matter. A third factor is the limited amount of money available for improving existing programs and developing new ones. Limited funds also curtail the development of programs which would allow instructors time and resources to prepare instructional materials for classroom use.

Educators appear to be in a struggle to cope with these problems. Yet, for the most part, they have been unable to solve them. One option is to look for new and improved methods of teaching and new patterns of instructional organization. This is the intent of this research.

Purpose

The purpose of this research was to develop instructional materials that illustrate the technique a student must master in producing material by offset duplication. These materials were designed as a series of single concept presentations encased in a cartridge.

Basically, the cartridge consists of a continuous loop filmstrip and synchronized audio tape, with the Audiscan System utilized as the viewing instrument. (See following illustration.)

Two instructional concepts have been developed and will be discussed in this thesis. Each concept requires the viewer to perform specific tasks in relation to the concept being presented. Upon completion of the two concepts, it is expected that the student will have successfully completed the performance tasks without assistance from the instructor and will then be ready for an evaluation period with the instructor.

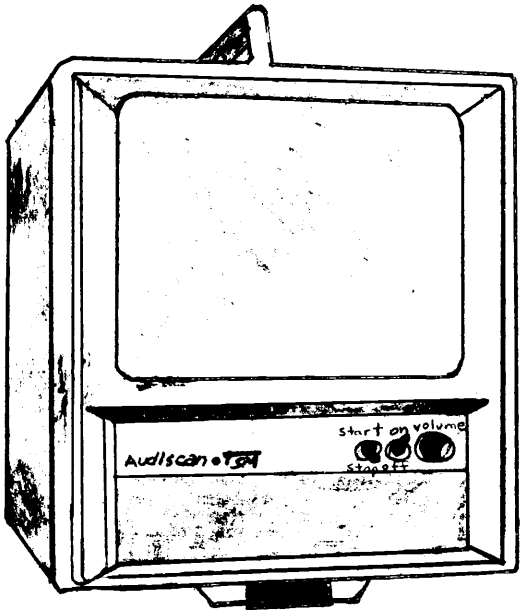
The design of this research proposal involved two major functions: First, the development of the materials; and second, the testing and evaluation of these materials.

Statement of the Problem

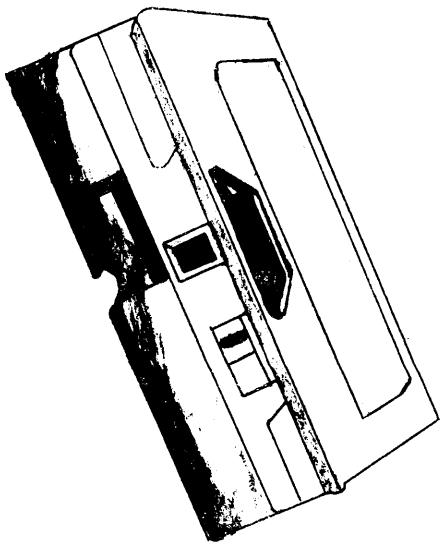
This research study was designed to show that those students who had the benefit and use of the Audiscan while typing an offset master and running the offset duplicator, would be able to complete two instructional concepts at a level better than students completing these concepts without the aid of the Audiscan.

Two courses, SS312 Office Procedures and SS215 Business Machines, were selected for the experiment because of the emphasis placed upon teaching duplicating techniques in these two courses.

Audiscan®
16MM CONTINUOUS-LOOP FILMSTRIP
AND SYNCHRONIZED SOUND TAPE



16MM CONTINUOUS-LOOP FILMSTRIP



AND SYNCHRONIZED SOUND TAPE

Figure 1. Audiscan Products.

Teaching repetitive techniques in duplicating requires a significant amount of time on the part of the instructor; a major contribution could be made, therefore, by developing materials which would free the instructor from this time-consuming process.

Significance

The significance of this research appears to have implications for groups: students, instructors, and industrial planners. Value to the student includes the availability of quality instruction at any given moment. The student may proceed at his own rate and will be able to view the concepts as many times as necessary. The materials also may be used for small group presentations.

The instructor is relieved of teaching repetitive functions and is able to do what he is supposed to do--teach. Hopefully, the value of this research will be recognized by educators and provide the impetus for the continual development of instructional media of this nature at all educational levels. Successful completion of this research should call attention to the fact that individuals with limited funds and resources are capable of developing programs.

A final point of significance is the value of this study to business and industry. In office procedures technology, essentially the same processes are used and individuals must be given the same instruction. In business, the implications of such materials could be equal

to those that apply to educational levels.

Hypothesis

The first objective of this research was to prepare the instructional concepts that were to be used in the classroom testing procedure. A second objective was to measure effectively the instructional media in terms of task performance on an individual student basis.

The research hypothesis that was tested with experimental and control groups is

> There will be a significant difference between experimental and control groups of students in a business class. The experimental groups, using new instructional concepts developed for the Audiscan system, and working without the assistance of an instructor, can complete two instructional concepts illustrating techniques of offset duplication. Their performance, measured by individual evaluation factors, will be superior to that of the control group, which did not use the concepts developed for the Audiscan.

The null hypothesis is

> There will be no significant difference between experimental and control groups involved in testing the research hypothesis.

If the research hypothesis is rejected, the null hypothesis will be accepted.

Assumptions

Three assumptions were made in this research study, none of which would appear to have any significant value in causing a part of the research findings to become suspect. These are basic assumptions necessary to the testing procedure. In addition, because the media and materials used were relatively new to students, it is unlikely that any of them had been "contaminated" by previous exposure to the offset process or the Audiscan System.

The first assumption is that all students involved in the testing will know how to use a typewriter. This does not imply that they must be either very accurate or very fast typists to master the concepts successfully.

The second assumption is that all students in the experimental group will be acquainted by the instructor with the operation of the Audiscan System prior to using the equipment.

The third assumption is that experimental and control groups are office administration students with almost equal skill and knowledge in that area. This factor will be confirmed by previous analysis from information gathered from each student.

Definitions

The following terms are explained for the casual reader who may not be familiar with the terminology used in this context. It should be noted that these expressions are related to this study, and one may find many different interpretations of these terms in other publications.

Audiscan - Audiscan is the registered name of the patented viewing instrument used by the experimental group. It is a continuous loop film and synchronized audio-tape projector.

Cartridge - A cartridge contains the 16mm loop film and audio tape. Each cartridge is confined to one concept.

Concept - A concept consists of the instructional material presented in the cartridge. For simplicity, each concept provides instruction for the completion of one specific task such as typing an offset master.

Instructional Concept - Same as concept.

Multimedia - Multimedia refers to the presentation of material by more than one instructional medium. A specific example would be an instructor giving a lecture that is supplemented by the use of a film and/or a tape recorder.

Systems Design - Reference is made to systems design as a means of looking at a problem, analyzing the situation, and providing a specific design towards the solution. The design

includes precise steps and procedures to solve the problem in its entirety.

CHAPTER II

RELATED LITERATURE

The investigation of related research finds considerable progress being made in certain areas of the audiovisual field. Many of the developments are quite recent and center around the 8mm sound motion picture. It is necessary to be aware also of the development of the systems approach to learning and the significance of preparing specific behavioral objectives. Research related to this proposal is drawn from a broad field rather than from one specific area of application. The critical point to note is that there appears to be an abundance of hardware that is reaching the market, but that relatively few programs (software) for use in education or business are available.

Throughout this paper, the use of the words "programmed instruction" has been avoided. This does not mean that the development of the materials suggested under this proposal are not programmed to a degree, but that the instructional media suggested are not exactly the same as many previous types of programmed instruction which did not meet with favorable results.

Ivarie (14) says that terms such as man-machine, multimedia, hardware, software, and learning system are frequently used when discussions center around innovation and experimentation in education. His concern with instructional strategy is similar to the objectives of

this research. In developing materials, Ivarie arranged them in units to meet the following specifications: each unit was to be correlated carefully with the others so that the content of each would enhance the content of the others; at the same time, none of the units was to be dependent upon any of the others to the extent that each could not be used independently. In addition, the specifications called for a system that could be controlled completely by the classroom teacher or be flexible enough for use in a highly individualized manner, thus allowing for differentiated rates of progress.

A leading (although controversial) program in multimedia has been developed during the past three years at Mt. San Jacinto College in California. Banister (4) gives his views on the multimedia aspect of the teacher role. He says that the implementation of multimedia may mean that educational institutions will have to encourage more teachers to become involved in curriculum planning and the writing of programs. One of the essential factors is the ability of the teacher-writer to analyze the structure of his subject matter and to be able to adhere to the task of writing multimedia programs over a long period of time. His statement concerning objectives is very appropriate. He indicates that the writer must ask himself: What is it that the student will be able to do after completing the entire course? In other words, the teacher should attempt to write the final examination of general behavioral goals before writing the program.

Mager (17) has presented an excellent programmed book on writing behavioral objectives for programmed instruction. He says that a statement of instructional objectives is a collection of words or symbols describing an educational intent. An objective will communicate an instructor's intent to the degree he has described what the learner will be doing when demonstrating his achievement and how the instructor will know when the learner is doing it. Mager's final comment is that if the instructor gives each learner a copy of his objectives, he may not have to do much else.

Some recognition should be given to Allen (1) and Gagne (11) for their contributions. They have indicated potential contributions of a variety of audiovisual and related media in terms of instructional functions and stimulus relationships to objectives. The following tables present their data.

In relation to the development of various media, McKim (18) reports on the use of short films in the medical field. In fact, the use of 8mm films and other media has been more evident in the medical field than in some other areas of education. He states that new criteria must be established to overcome some of the traditional objections to traditional educational films: A) films should be made available to individuals or small groups of students at the students' convenience, B) films should be encased in a continuous-loop cartridge to eliminate the necessity for rewinding and rethreading, C) the

Table 1. Instructional Functions of Various Media.

Function	Media						
	Objects; Demonstration	Oral Communication	Printed Media	Still Pictures	Moving Pictures	Sound Movies	Teaching Machines
Presenting the stimulus	Yes	Limited	Limited	Yes	Yes	Yes	Yes
Directing attention and other activity	No	Yes	Yes	No	No	Yes	Yes
Providing a model of expected performance	Limited	Yes	Yes	Limited	Limited	Yes	Yes
Furnishing external prompts	Limited	Yes	Yes	Limited	Limited	Yes	Yes
Guiding thinking	No	Yes	Yes	No	No	Yes	Yes
Inducing transfer	Limited	Yes	Limited	Limited	Limited	Limited	Limited
Assessing attainments	No	Yes	Yes	No	No	Yes	Yes
Providing feedback	Limited	Yes	Yes	No	Limited	Yes	Yes

Table 2. Instructional Media Stimulus Relationships to Learning Objectives.

Instructional Media Type	Learning Objectives					
	Learning Factual Information	Learning Visual Identifications	Learning Principles, Concepts and Rules	Learning Procedures	Performing Skilled Perceptual-Motor Acts	Developing Desirable Attitudes, Opinions and Motivations
Still Pictures	Medium	High	Medium	Medium	Low	Low
Motion Pictures	Medium	High	High	High	Medium	Medium
Television	Medium	Medium	High	Medium	Low	Medium
3-D Objects	Low	High	Low	Low	Low	Low
Audio Recordings	Medium	Low	Low	Medium	Low	Medium
Programed Instruction	Medium	Medium	Medium	High	Low	Medium
Demonstration	Low	Medium	Low	High	Medium	Medium
Printed Textbooks	Medium	Low	Medium	Medium	Low	Medium
Oral Presentation	Medium	Low	Medium	Medium	Low	Medium

soundtrack for the film should be on magnetic striping to permit updating, and D) the films should be accompanied by some form of student participation; preferably programmed instruction, to reinforce the content of the film.

Investigation by the military branches of the government in training men with films has indicated many of the same points noted by McKim were evident during World War II. The United States Office of Naval Research indicates that ideally, in film learning situations, steps should be small enough to ensure that students make few errors. At the same time, the step size should be large enough to prevent boredom. There should also be an immediate feedback of information. This permits the student to view a short section of the film and respond to the corresponding portion of the program before continuing with the remainder of a film.

A number of frames in a program should pose actual practice problems. These should be of the responsive or performance type of problem. Another key point is that each program should be subject to developmental testing in an attempt to locate possible points that may be confusing to the student.

While most research points to the use of 8mm films as the source of studies and experiments, the Audiscan System presented in this proposal is relatively new in the educational field. The machine is approximately three years old and only recently have programs

appeared on the market for distribution. As of this moment, no known Audiscan programs are available for use in business education programs. The one big apparent advantage is the ability of the system to allow the student to control the "stop and go" action. The Audiscan leads the student through a procedural step and then waits for the performance step by the student before proceeding to the next procedural step.

While much is being developed in the multimedia field itself, a great deal is being written about the systems concept and the use of models. This is directly tied to the preparation of materials, as both Ivarie (14) and Banister (4) indicate in their reports.

Carver (7) indicates that the systems concept is a way of thinking about a problem or situation, the establishing of effective channels of communication, viewing problems in their broad perspective, and seeing all the interrelationships of the various parts of the problem or situation. Feedback for measurement purposes is also an important part of this concept. Business educators should be aware of this concept and the ways in which it might apply to their particular fields. He further states that the method/media strategy is the determination of what method of instruction and what media will be used to make the most effective presentation of the material, or the determination of the best way to produce the desired outcomes.

Littlefield (16) emphasizes that office work is being

revolutionized by the systems and procedures approach. There is nothing new about the systems concept. He defines system as a network of procedures which are integrated and designed to carry out a major activity. The use of systems in office management stresses conceptual skills. One must be able to visualize and understand the relationship between the job and all functions within it.

Recent developments in the film industries have grown out of many advances in previous media, slide sets and film strips. One authority, Deletzke (9) provides a background sketch. Thirty or forty years ago, industry pioneers came out with an early combination film strip and record player. In these first stages there were audible bongs or bells that indicated the need for a manual slide change. Then came the automatic changing of slides with such mechanical devices as notched films and molded indentations.

There were problems with these systems. The records were breakable. They were easily scratched or distorted by heat. They wore out quickly. Threading problems with the film strip further complicated matters.

Since the late 1950's, the trend has been away from the records toward portable, attache-case size cartridge-loaded systems manufactured by such companies as Audiscan, La Belle, and DuKane.

These systems, according to Deletzke, are virtually "goof-proof." There are no slides to stack, no framing problems, no film

to thread, no tape to wind, no records to scratch. There is simply a 16mm or 35mm continuous-loop film strip and synchronized audio-tape system that can be programmed (in the case of Audiscan's 16mm equipment) for up to 33 minutes of sound and 225 visuals in a single cartridge.

Recent trends and instructional techniques have also resulted in significant advances. A 1970 planning report issued by ERIC at Stanford, Allen (2) summarized educational media and technology according to the following categories:

1. Individualization of Instruction. A trend toward greater emphasis on the determination of individual learning requirements--and then the design of learning experiences, environments, materials and procedures that will meet these objectives--is strongly indicated. (The important role that instructional technology will play in this movement is obvious.) Extensive individualization of instruction often requires extensive instrumentation and a mass of instructional materials of all kinds.

2. "Accountability" for Learning. "Accountability" has been referred to as the big educational catchword of today. Yet the concept of accounting for the learning that results from schooling may be more than a catchword; it may bring about a reexamination of the educational process and put the burden of responsibility on educators to develop quality education of proven value. They may then be

forced to discover and employ the most effective techniques of instruction which are available. In the process, instructional technology may come to play a more central role in instruction.

3. The Systems Approach to Education. The emphasis on the systems approach and its application to the development of integrated large--and small-scale systems of instruction utilizes one of the products of technology. It would appear that instructional media will be more widely employed as courses are redesigned and as the part such media can play in the enhancement of instruction is determined.

4. Increasing Emphasis on Instructional Materials. There would appear to be at least verbal recognition of the need for more scientifically designed and educationally relevant instructional materials. The trend may well be away from the proliferation of many incompatible devices and toward the production of validated materials to fit the instruments we now have.

5. Need for Demonstrations of Effectiveness and Procedures. Finally, it is apparent that more demonstration projects should be funded, and that these might account for a large share of the government's future commitment to instructional technology development. The trend will be away from basic research toward applied research which is readily transferable to the operational level of education.

Learning Theory

The process of learning is an individual experience for each person. Learning takes place whenever an individual's behavior is modified--when he thinks or acts differently or when he has acquired new knowledge or a new skill.

Several psychologists have pointed out areas of emphasis and agreement common to all learning theories. Two writers have offered practical interpretations of selected psychological concepts in the media field. C. R. Carpenter, a psychologist, and Edgar Dale, an educator, focus on audiovisual materials in terms of learning. Ten of their principles follow, the first seven from Carpenter (6) and the other three from Dale (8):

Importance of motivation to the learner. The most basic and persistent task of teaching is to release, instigate, and increase these motivational forces: interest and the need, desire, and wish to learn.

The personal relevance concept. Teaching materials are effective in an ordered manner depending on the degree of their personal relevance (meaningfulness) to individual students. The production and the use of teaching materials require judgments of their relevance to the individuals to be taught--their abilities, levels of achievement, activated and latent interests, and accepted objectives of academic achievement.

Selected processes and audiovisual instruction. What is presented to students and what is accepted and learned by them are very different. The individual interposes his entire relevant life history between the stimulus material and his own response.

The need for organization. More information can be learned more enduringly when materials are meaningfully and systematically organized than when they are unorganized or poorly organized.

The need for participation and practice. Learning is activity. A widespread criticism of audiovisual materials and methods is that they preclude participation and overt practice. Using symbols, abstracting, deducing, generalizing, inferring, and concluding are all intimately involved in learning.

Repetition and variation of stimuli. Generally it may be said that nothing absolutely new is ever learned effectively with one exposure. Repetition functions to reinforce and extend learning and to make the learned information more enduring. Repetition with variation provides time for learning, and time for learning is absolutely essential.

The rate of presentation of material to be learned. The rate of presentation of information in relation to the comprehension rates of students is a fundamental consideration in learning. Rate is determined in part by the number, complexity, and subjective difficulty of the materials to be learned.

Clarity, relevance, and effectiveness. The clearer, the nearer, the more realistic and relevant the statement of desired outcomes, the more effective the learning. Be sure the learner knows what is expected of him from the first.

Teaching for transfer. Old learning does not automatically transfer to new learning. A deliberate effort must be made to teach for transfer. Students need guided practice in learning to transform or reconstruct habitual ways of doing things.

Reporting results promptly. Learning is increased by knowledge of results. Information about the nature of a good performance, knowledge of mistakes, and knowledge of successful results aid learning.

A useful addition to this list of psychological concepts is a statement from principles by Bugelski (5) that in keeping with the changing approach to teaching and learning.

Learning is done by the learner and not by some kind of transmission process from the teacher. The function of the teacher is to prepare the situation and the chains of events in such fashion that the learner has the maximum possibilities of acquiring the proper "connections."

It is generally accepted that visual acuity plays an important part in the learning process of the typing student. Many students fail to grasp the significance of instructions when these are given verbally. It has been suggested that with better use of the sense of hearing,

used with the other senses, more desirable response patterns may be produced.

Socony-Vacuum Oil Company has published a study which substantiates this theory. The study shows that when telling is used alone, recall three hours later is 70 percent; three days later--ten percent. Showing when used alone produced better recall three hours later--72 percent and 20 percent recall three days later. However, when a blend of telling and showing is used the recall three hours later has risen to 85 percent and after three days--65 percent (20). In a speech given in 1966, Mr. Robert Hutchings of IBM referred to the learning process:

> In studying the learning process, we are brought face to face with the fact that in less than half a day people forget 60 percent of everything they have been exposed to. In about 11 hours over half of all the communications people receive have been forgotten. That certainly makes it tough for a teacher who is trying to build interest in a subject such as typewriting or office practice.
>
> A basic reason for this is that listening is hard work. The brain soon tires and tunes out after a period of time. Educators call this brief time period the attention span. What a burden it must be for you who spend most of your time during the day talking, to find out that your students learn only 11 percent of what they have been exposed to from what they hear. As a matter of fact, the relative effectiveness of the five senses and how people learn, looks like this: They learn one percent of what they know through taste, 1-1/2 percent through smell, 11 percent through hearing, and, get this, an overwhelming 83 percent through the sense of sight. There are no other ways than these five senses for people to communicate with each other. . . . Businesses don't get much selling mileage out of the sense of taste or smell because they are often blocked from the best sense, the sense of touch. My point is this: The

> most flexible and convenient way to get things understood is the strategic use of the senses; sight, sound, and touch. Merging these basic communication concepts to problem solutions may make the tough job you've got to do a little bit easier (13).

If you are a person interested in planning and producing audio-visual materials, you should review and weigh all the evidence from research findings and theory available. These findings, rather than intuition, should be considered as you design your own materials for instruction. Start with these results and recommendations, realizing that some may have been derived from situations far afield of the applications you plan to make. (Yet they are starting points with positive evidence for improved learning at lower costs in terms of time, materials, and services.) Then adapt and change as you gain experience and test the results of your efforts.

CHAPTER III

DESIGN AND DEVELOPMENT OF AUDISCAN MEDIA

The research project included the design and development of two concepts, which required several months to design and complete. Therefore, it appears appropriate to devote space in this study to illustrate the organization and development of Audiscan materials.

While it would be impossible to explain every step in detail, some explanations will be given, accompanied by illustrations to assist the reader in understanding the steps involved in developing the media and to facilitate the actual development of similar materials by those individuals who might be interested in doing so.

It should be noted that this design is certainly subject to modification, and no one should attempt to develop his own media following this exact pattern unless his objectives are identical to those of this research study.

Analyzing Costs and Facilities

To complete the production planning it is essential to determine factors involving costs and facilities. There is no limit to how much can be put into the media, but the facilities that are available will impose limitations upon what can be accomplished. In this research study, facilities were available which allowed costs to be minimized

and the entire process to be completed within the university system. This was a unique situation which might not work within every educational unit. If instructors would take advantage of whatever facilities that exist within the local system, many of them could save several steps in the production process and might not need to call upon outside sources for the completion of the materials. It should be noted that when outside sources are called upon to assist in photography, taping scripts, and reducing slides from 35mm to 16mm, the estimated costs for one concept are extremely high. While this process is expensive, according to commercial estimates, many large schools may find it possible to complete the production by using their own facilities.

Objectives

The first step in developing the media is to determine objectives. It is ideal to cite specific educational objectives which determine what the student will be doing, how the student will be doing it, and what the student will accomplish upon completion of the concept.

The particular objectives of this research study have been formulated using the criteria and the terminology of the behavioral objectivists:

A student using the Audiscan system will be shown the steps in typing an offset master which requires student performance

following the presentation of each step. Upon completion of the concept the student is expected to have completed successfully the typing of an offset master without the assistance of an instructor. Evaluation by the instructor will determine if the student has used correct procedures as observed in the concept of preparing the offset master.

Students must be aware of the purpose of these objectives and be able to identify them successfully. To communicate these intents, we need to define clearly the scope and limit of the material to be learned. What do we hope to accomplish with this presentation? Do we intend to change attitudes? Are we attempting to give factual information? Are we trying merely to motivate people, or are we teaching the students to perform a certain function as in the Audiscan research project under discussion.

Procedures

The following procedures, suggested by Eastman Kodak and followed by this writer, provide guidelines for the individual producer (9).

Plan the Production. A "story board" is one of the best aids to planning and controlling the production of a slide or filmstrip sequence. The 3 x 5 inch or 4 x 6 inch cards making up your story board may be arranged on a desk or table or on a sizeable

"planningboard" (usually about 3 by 4 feet in size). The cards remain free to be re-positioned and studied simultaneously whenever necessary.

First, record the necessary information on each card, preferably letting each card represent a single slide or filmstrip frame. Write on the lower part of the card a summary (not a finished script) of the commentary to be heard while the illustration appears on the screen. In a rectangle on the left side sketch the major elements of the desired illustration. Use a photograph, artwork, or a combination of both. This information--along with any other production notes (long shot, extreme close-up, background color, etc.)--can be placed to the right of the sketch.

Plan for Picture Story. With the cards in place, the story board shows at a glance the continuity of the presentation and the way the narrative ties in with the visuals. All of the information is contained on the board, for it is a plan for a picture story.

Planning-cards help to organize the story by forcing the writer to clear up any hazy thinking about the content of each illustration. Since each slide or filmstrip frame contains but a single idea, cards on the story board can be readily shuffled, added, or deleted. Developing a sequence in this way--point by point--has proved to be easier than writing a script that must then be visualized paragraph by paragraph. The result of this latter method is most often a

slow-moving illustrated talk in which the visuals appear superfluous.

Story at a Glance. Production is greatly facilitated by the use of a story board. The producer, the writer, and the photographer can at a glance become familiar with the entire story line. From the copies you provide, they see how each illustration relates to others in the sequence, and they learn what ideas will be presented with each word-and-picture combination. The elements fit together because the people in the production group know the whole story as they work on each phase of it.

You can utilize the story board to give a preview of your presentation--for your own evaluation or for review by others--at any time during the development of the story. Progress is not interrupted because production people have copies. Furthermore, you can polish the script while the pictures are being produced.

Assemble Photos and Art. In taking the photographs, follow the story board and shoot multiple shots for each slide, varying the stops to achieve the ideal exposure. Much of the content may come from flat reflection copy such as drawings, maps, charts, graphs, photographs, paintings, printed texts, half-tones, and titles. Here, you have to be very careful with positioning, masking, lighting, and focus. Most 35mm cameras are fitted with lenses of approximately 50mm (2-inch) focal length. Few of them will focus at the short distances required for copying slides and reflection copy, but you can

obtain supplementary lenses that will make the normal lens suitable for close-up work, or your own cameras may be adaptable to extension tubes or bellows or similar means of focusing at the short distances required. For even better results, some photographers rely on copy stands that assure proper lighting and focus.

Lettering. In preparing titles and artwork, three-dimensional title letters, either ceramic or plastic, are available from most camera and art shops in many styles and sizes. They are relatively inexpensive and can be used indefinitely. You simply place them on a colored-paper background for copying. (Preferably dark, soothing background colors that assure good contrast and avoid the dazzling effect often caused by brighter, lighter colors.)

Other lettering systems that can save time and money are also available. They include rub-on transfer letters--which adhere easily to most surfaces and create a neat, professional "printing job"--lettering guides, and stencil sets.

Write the Script. According to one editor, you learn script writing by talking to yourself to hear how things sound. You write (again with the story board as your guide) in short paragraphs with dialogue timed for the slides. You must also consider the possible emotional value of music and sound effects, and the surprising fact that with modern equipment permitting up to five frame changes a second, (24 frames a second in motion pictures) a filmstrip can even

provide the illusion of motion.

There are many ways to go about script writing for slide shows and filmstrips, but there is very little expert advice on the subject. Most writers must proceed strictly on their own.

Produce the Show. Of all types of photographic visual aids, filmstrips require the most care, equipment, and skill in carrying out the various steps with a minimum of film waste. Preparing many copies of a filmstrip with conventional cameras and printing equipment is so time-consuming as to be impractical. When you need many copies, it is advisable to take your original material to a laboratory specializing in the production of filmstrips. First, of course, you should find out the laboratory's requirements regarding the size and photographic characteristics of your visual and audio offerings. Select your own slides in advance. Run them through a Carousel as a final check on sequence, and make sure that all slides to be used in filmstrips are horizontal format.

Consistency of size, color, and density is very important for top quality in slides.

CHAPTER IV

DESIGN AND METHODOLOGY OF THE STUDY

The nature of experimental research requires that the design be specified in such a way as to indicate the experimenter's method of providing for the collection of evidence in such a way that inferences of a relationship between the independent and dependent variables can be drawn as surely as possible. If two groups have been satisfactorily matched before introduction of the experimental (independent) variable to the experimental group, and if adequate control is achieved to keep experimental conditions as pure as possible, then the difference between the scores of the two groups should constitute a measure of the effectiveness of the experimental variable. In this study, the independent variable is the use of the Audiscan in completing a performance task.

Design

This study belongs to the control-and-experimental group design with individual performance being observed and evaluated independently for each student. The significance of the testing is in observing whether or not the student can successfully complete the performance steps without the assistance of the instructor. The media and materials being used in the design will be unfamiliar to the

student--in most cases. Data will be recorded if the student has had some previous exposure to the media and materials. However, because of the relatively new concept being used, it is very unlikely that the student will have previous knowledge other than visual contact. Randomization of assignment of the two groups was employed to assure lack of initial biases between the groups. The experimental or independent variable (X) was introduced in the experimental group only, and not in the control groups. Students were placed in groups by alternating alphabetical sequence which had been listed by the computer. Students did not know which group they were in until previous to their testing of the materials, thus decreasing reactions that sometimes develop when students are aware of their group and tend to react psychologically with some bias.

Subjects

The population for this study consisted of business students in a college-level Office Procedures class and a Business Machines class. Each class was randomly divided into control and experimental groups. Each class represented a different level of age and education. Since the main purpose of the study was to determine the effectiveness of the media, the groups were not consistent in size, assuming that a smaller group would provide the same results as a large group, because each student is evaluated individually, on a one-and-one basis.

Research points out that intense one-and-one studies are as significant as large groups studies where it is more difficult to control variables and other factors which create suspicion in the research findings.

The Office Procedures class consisted of one experimental group of 19 students and one control group of 19 students. Each group was selected by compiling a complete alphabetical list of the 38 students in the class. On the "flip-of-a-coin" basis, the control group received odd numbers and the experimental group even numbers.

Each group was then measured to determine if it consisted of a representative sample. This measurement was based on the following data: 1) age, 2) accumulative grade point average, 3) number of college quarters completed, and 4) a timed-writing score. Age was determined to the closest half year. Grade point averages and number of college quarters completed were calculated as of the previous quarter. The timed-writing score consisted of the top score out of four possible efforts. Since each score represented a perfect copy (no errors were allowed) the accuracy factor was automatically incorporated into their resulting score.

Data compiled from the two groups are shown on Tables 1, 2, 3 and 4. These data indicate average scores for each group as well as median scores. The median scores appear to be more reliable and indicate no significant difference in the composition of the control and experimental group.

Table 3. Office Procedures Control Group Average Scores.

Student	Age	GPA	Quarters	Timed Writing
1	20.0	2.43	7	60
3	21.0	3.28	7	76
5	22.0	3.20	7	64
7	20.5	2.40	7	66
9	21.0	2.83	7	66
11	20.5	2.10	7	58
13	20.5	2.79	7	76
15	20.0	2.65	7	59
17	22.0	2.40	10	65
19	19.5	2.63	7	65
21	21.0	2.40	7	68
23	20.5	2.88	6	68
25	22.0	2.68	10	41
27	20.5	2.80	7	84
29	20.0	2.78	7	63
31	21.5	2.85	6	70
33	20.0	2.81	7	79
35	21.0	2.39	8	54
37	20.0	2.68	7	77
Total	393.5	509.8	138	1259
Average	20.7	2.68	7.26	66.26

Table 4. Office Procedures Control Group Median Scores.

Age	GPA	Quarters	Timed Writing
19.5	2.10	6	41
20.0	2.39	6	54
20.0	2.40	7	58
20.0	2.40	7	59
20.0	2.40	7	60
20.0	2.43	7	63
20.5	2.63	7	64
20.5	2.65	7	65
20.5	2.68	7	65
20.5	2.68	7	66
20.5	2.78	7	66
21.0	2.79	7	68
21.0	2.80	7	68
21.0	2.81	7	70
21.0	2.83	7	76
21.5	2.85	7	76
22.0	2.88	8	77
22.0	3.20	10	79
22.0	3.28	10	84
20.5	2.68	7	66

Table 5. Office Procedures Experimental Group Average Scores.

Student	Age	GPA	Quarters	Timed Writing
2	20.0	2.99	7	74
4	20.5	2.30	7	57
6	21.5	2.78	7	62
8	20.0	3.50	7	64
10	20.0	2.54	4	73
12	22.0	2.30	7	53
14	22.5	2.50	10	47
16	20.0	3.54	6	58
18	28.0	3.50	6	73
20	21.0	2.80	7	65
22	21.5	2.40	9	74
24	31.5	4.00	7	72
26	19.5	2.30	4	73
28	21.5	2.14	7	55
30	56.0	3.32	9	72
32	21.0	2.35	7	56
34	20.5	3.45	6	73
36	21.5	2.31	10	68
38	20.5	2.17	7	67
Total	449.0	53.19	134	1236
Average	23.63	2.79	7.05	65.05

Table 6. Office Procedures Experimental Group Median Scores.

Age	GPA	Quarters	Timed Writing
19.5	2.14	4	47
20.0	2.17	4	53
20.0	2.30	6	55
20.0	2.30	6	56
20.0	2.30	6	57
20.5	2.31	7	58
20.5	2.35	7	62
20.5	2.40	7	64
21.0	2.50	7	65
21.0	2.54	7	67
21.5	2.78	7	68
21.5	2.80	7	72
21.5	2.99	7	72
21.5	3.32	7	73
22.0	3.45	7	73
22.5	3.50	9	73
28.0	3.50	9	73
31.5	3.54	10	74
56.0	4.00	10	74
21.0	2.54	7	67

The Business Machines class consisted of one experimental group of 13 students and one control group of 13 students. Each group was selected by compiling a complete alphabetical list of the 26 students in the class. At the start of this study, each group consisted of 14 students, but two of them dropped the class before the experiment began. However, they are included in the tables (by number only) because the alphabetical selection of the two groups was made while they were still enrolled in the class.

Each group was then measured to see if it consisted of a representative sample. Data compiled from these two groups consisted of the following information: 1) age, 2) accumulative grade point average, 3) number of college quarters completed, and 4) major field of study. A timed-writing score was not taken from these two groups because they consisted of some students from a field other than Business Education or Office Administration. In addition, the amount of typing these students had taken varied to such a degree as to raise the question whether this score would be significant. It is interesting to note that there were four non-business majors in each group. The additional statistics verified the closeness of the representative sample of the two groups.

Data compiled from these two groups are shown in Tables 7, 8 9 and 10. These data indicate average scores for each group as well as median scores.

Table 7. Business Machines Control Group Average Scores

Student	Age	GPA	Quarters	BE/OA Major
2	19.5	2.67	4	yes
4	20.0	2.00	1	yes
6	19.0	2.50	2	no
8	19.5	2.23	3	yes
10	21.5	2.51	7	yes
12	19.5	2.14	4	yes
14	21.5	2.20	10	yes
16*				
18	21.0	2.50	9	no
20	19.5	3.95	4	no
22	18.0	2.25	4	yes
24	19.5	2.72	5	yes
26	19.5	2.72	5	yes
28	21.0	2.39	11	no
Total	259.0	32.78	69	
Average	19.92	2.521	5.30	

*Student withdrew from class.

Table 8. Business Machines Control Group Median Scores.

Age	GPA	Quarters
18.0	2.00	1
19.0	2.14	2
19.5	2.20	3
19.5	2.23	4
19.5	2.25	4
19.5	2.39	4
19.5	2.50	4
19.5	2.50	5
20.0	2.51	5
21.0	2.67	7
21.0	2.72	9
21.5	2.72	10
21.5	3.95	11
19.5	2.50	4

Table 9. Business Machines Experimental Group Average Scores.

Student	Age	GPA	Quarters	BE/OA Major
1	20.0	2.49	4	yes
3	20.5	2.21	7	yes
5	22.0	2.85	1	yes
7*				
9	20.5	2.56	8	yes
11	18.5	2.93	2	yes
13	20.5	2.68	7	no
15	20.0	3.16	4	yes
17	21.0	2.44	7	yes
19	20.5	3.03	7	yes
21	21.0	2.86	9	no
23	20.0	3.47	4	yes
25	21.5	2.79	10	no
27	20.0	2.02	4	no
Total	266.0	35.49	74	
Average	20.5	2.73	5.69	

*Student withdrew from class.

Table 10. Business Machines Experimental Group Median Scores.

Age	GPA	Quarters
18.5	2.02	1
20.0	2.21	2
20.0	2.44	4
20.0	2.47	4
20.0	2.49	4
20.5	2.56	4
20.5	2.68	7
20.5	2.79	7
20.5	2.85	7
21.0	2.86	7
21.0	2.93	8
21.5	3.03	9
22.0	3.16	10
20.5	2.68	7

Measurement

Each student was evaluated individually in relation to successful task performance and the effectiveness of the instructional materials.

The data gathered have been evaluated to determine:

1. The effectiveness of the instructional medium in relieving the instructor from repetitive teaching.
2. The effectiveness of the instructional medium in leading the student successfully through the program and fulfilling the behavioral objective without assistance from the instructor.
3. Ability of the student to develop sufficient awareness from the instructional technique to be able to complete a series of performance functions related to office procedures technology.

The students in the experimental group using the Audiscan as the independent variable were observed and evaluated while completing two separate concepts. The first instructional concept was entitled "Offset: Typing an Offset Master". The second instructional concept was entitled "Offset: Duplicating Copies".

The two concepts differed in degrees of difficulty according to the following:

1. The first concept contained only 34 frames in the cartridge, which required a lesser number of performance tasks by

the student. The second concept contained 51 frames in the cartridge and required a greater number of performance tasks by the student.

2. The first concept required the use of a typewriter, with which almost all the students were very familiar. The second concept required the operation of the offset machine with which none of the students were familiar. Few had even seen it.

3. The second concept required the student to use materials while operating an unfamiliar machine.

In general terms of difficulty, running the offset duplicator would be considered far more difficult than typing the offset master.

Procedures

All students selected for the experimental group used the Audiscan System as the means of viewing the two concepts and receiving instructions related to task performance. All performance functions, other than those automatically programmed into the film, were within the control of the student: stopping and starting at specific points.

Once the student began a specific concept, the instructor did not provide assistance unless the student was unable to proceed beyond a certain point because of his inability to interpret the information provided on the program. The independent variable was the Audiscan

System containing the main portion of the instructional media. Students had to be able to use a typewriter effectively. Speed and accuracy were not essential. Therefore, the actual amount of previous typewriting instruction is not a significant factor to consider. All evaluations were made by the writer and one other instructor. All students were evaluated by the same standards, and each student had his performance charted.

The control group was taught by the traditional method of lecture and demonstration. This is the procedure used in the past for teaching basic functions and concepts in the classroom which relate to the operation of duplicating machines and/or equipment. Students in the experimental and control groups simultaneously received an introduction to the offset duplicating process in order to provide them with familiarization as to the materials and equipment involved. Therefore, neither group was exposed to variables in the manner in which these data were presented. Following this introduction, the control group received a demonstration while the experimental group utilized the Audiscan System.

Student Questionnaire

Information was gathered from the experimental and control groups to determine their familiarity with the equipment being utilized during these testing stages of the study. This information is

given in Tables 11, 12, 13 and 14. The two most important questions were: 1) Have you typed an offset master? and 2) Have you run an offset duplicator? These two questions were helpful in determining if a control or experimental group had an advantage because of having previously been exposed to the offset master and the offset duplicator.

Table 11. Office Procedure Control Group Questionnaire.

1. Have you used a "Selectric" typewriter before?
2. Have you typed an offset master?
3. Have you used offset eraser for correction?
4. Have you run an offset duplicator?
5. Have you used an Audiscan before?

Student		1	2	3	4	5
1		yes	no	no	no	no
3		yes	no	no	no	no
5		yes	no	no	no	no
7		yes	no	no	no	no
9		yes	no	no	no	no
11		yes	no	no	no	no
13		yes	no	no	no	no
15		yes	no	no	no	no
17		yes	no	no	no	no
19		yes	no	no	no	no
21		yes	no	no	no	no
23		yes	no	no	no	no
25		yes	no	no	no	no
29		yes	no	no	no	no
31		yes	no	no	yes	no
33		yes	yes	yes	no	no
35		yes	no	no	no	no
37		yes	yes	yes	no	no
Total	YES	19	2	2	1	0
Total	NO	0	17	17	18	19
Percent	YES	100	10.5	10.5	5.3	0
Percent	NO	0	89.5	89.5	94.7	100

Table 12. Office Procedures Experimental Group Questionnaire.

1. Have you used a "Selectric" typewriter before?
2. Have you typed an offset master?
3. Have you used offset eraser for correction?
4. Have you run an offset duplicator?
5. Have you used an Audiscan before?

Student		1	2	3	4	5
2		yes	no	no	no	no
4		yes	no	no	no	no
6		yes	no	no	no	no
8		yes	no	no	no	no
10		yes	yes	yes	yes	no
12		yes	yes	yes	no	no
14		yes	yes	yes	no	no
16		yes	yes	yes	no	no
18		yes	yes	yes	no	no
20		yes	no	no	no	no
22		yes	no	no	no	no
24		yes	no	no	no	no
26		yes	no	no	no	no
28		yes	no	no	no	no
30		yes	no	no	no	yes
32		yes	no	no	no	no
34		yes	yes	yes	yes	no
36		yes	no	no	no	no
38		yes	no	no	no	no
Total	YES	19	6	6	2	1
Total	NO	0	13	13	17	18
Percent	YES	100	31.6	31.6	10.5	5.3
Percent	NO	0	68.4	68.4	89.5	94.7

Table 13. Business Machines Control Group Questionnaire.

1. Have you used a "Selectric" typewriter before?
2. Have you typed an offset master?
3. Have you used offset eraser for correction?
4. Have you run an offset duplicator?
5. Have you used an Audiscan before?

Student	1	2	3	4	5
2	yes	no	no	no	no
4	no	no	no	no	no
6	no	no	no	no	no
8	yes	no	no	no	no
10	no	no	no	no	no
12	yes	no	no	no	no
14	yes	no	no	no	no
16*					
18	no	no	no	no	no
20	no	no	no	no	no
22	yes	no	no	no	no
24	yes	no	no	no	no
26	no	no	no	no	no
28	no	no	no	no	no
Total	6	0	0	0	0
Total	7	13	13	13	13
Percent	46	0	0	0	0
Percent	54	100	100	100	100

*Student withdrew from class.

Table 14. Business Machines Experimental Group Questionnaire.

1. Have you used a "Selectric" typewriter before?
2. Have you typed an offset master?
3. Have you used offset eraser for correction?
4. Have you run an offset duplicator?
5. Have you used an Audiscan before?

Student		1	2	3	4	5
1		yes	yes	yes	no	no
3		yes	no	no	no	no
5		yes	yes	yes	no	no
7*						
9		yes	no	no	no	no
11		yes	no	no	no	no
13		no	no	no	no	no
15		yes	no	no	no	no
17		yes	no	no	no	no
19		yes	no	no	yes	no
21		no	no	no	no	no
23		yes	no	no	no	no
25		yes	no	no	no	no
27		yes	no	no	no	no
Total	YES	11	2	2	1	0
Total	NO	2	11	11	12	13
Percent	YES	84.6	15.4	15.4	7.7	0
Percent	NO	15.4	84.6	84.6	92.3	100

*Student withdrew from class.

CHAPTER V

ANALYSIS OF DATA

Pilot Study

During the Fall quarter of 1970, a pilot study was conducted using 30 members of a business machines class as an experimental group. The objective of using this experimental group was to determine if the first concept (Offset: Typing an Offset Master) being prepared for the Audiscan contained weaknesses in terms of student reaction to the program. This appeared to be a valuable experiment, as it detected several cases of weaknesses.

To run this experiment, the slides were arranged in a carousel and shown on a screen directly in front of the student at a range of approximately six feet. The script was typed on 3 x 5 cards and placed beside the student next to the carousel. The student controlled the carousel manually by advancing one slide at a time and reading the corresponding script on the card.

The analysis of this experiment indicates that this experimental group was capable of completing the first concept with the same degree of success as those later enjoyed using the actual Audiscan System. Out of the 30 students only two required some assistance.

The value of this experiment also can be related to the cost-

saving factor of shooting new slides and changing the narration when necessary before final film strip production. Once a final film strip is made and placed in the cartridge, it is almost impossible to make additional changes without involving a considerable cost factor and additional time to make the correction. A definite advantage acquired from this experiment is the demonstration of the feasibility of producing instructor-developed concepts at a minimum cost and putting them to use in the classroom. The disadvantage of continual use of a carousel and script on cards is the fact that it requires the student to use his hands to operate the carousel, flip the script on the cards, and set up the projector and screen. The Audiscan System, being self-contained in a cartridge, does eliminate the necessity for the student to perform several functions simultaneously while running a program.

Current research in the office machine field indicates that manufacturers are continually striving to develop machines which can be operated by the simple method of pushing a button. This is especially true of the new machines for instructional purposes. Students who are required to operate a complex mechanism will eventually quit using it. The same is true of instructors who use audiovisual equipment; they tend to use it less if the equipment requires time and effort either to learn or set up for student use. The Audiscan can be called ideal from this standpoint. It requires only one motion to advance the film, and this may be made by a foot feed, thus freeing the

hands for performance tasks.

Concept One Findings

Concept one consisted of preparing a typewritten offset master and making corrections. Control and experimental groups were used in the Office Procedures and Business Machines class. The Office Procedures control and experimental groups of 19 members each completed the concept successfully. The control group required assistance once, while the experimental group did not require the assistance of the instructor. The control group made errors on five of the offset masters, while none of the experimental group left uncorrected errors on their masters. The control group results indicate that 12 students deviated from instructions, while only three students did likewise in the experimental group. There appears to be a substantial difference in the quality of the master (errors and variations in instructions) between the two groups. It was observed during the testing that the experimental group did not proceed as rapidly as the control group because its speed was controlled to a degree by the Audiscan machine. However, the tendency to deviate from the instructions by those in the control group, is unexplainable by the data, as they were given the exact guidelines and examples to follow.

The Business Machines control and experimental groups related similar trends. Of 13 students in each group, five in the control

group required assistance while completing the typing of the master, while none of the experimental students called for the instructor. Five students in the control group made errors, and six deviated from the instructions. Only three in the experimental group made uncorrected errors and only three deviated from instructions. Tabulations on Tables 15, 16, 17 and 18 provide a summary breakdown of the results.

Concept Two Findings

Concept two consisted of procedures for running the offset duplicator. The offset master prepared in concept one was used to produce these copies. The Office Procedures and Business Machines experimental and control groups used for testing concept one were used again. There were no changes in the groups.

Concept two was quite different from concept one in terms of difficulty. While concept one required the use of a typewriter, with which students were generally acquainted, concept two required the student to operate an offset machine, with which most students were not acquainted prior to enrolling in the Office Procedures or Business Machines course. In addition, the total number of responses required by each student exceeded those in concept one. The student was required to do more with equipment and materials of which he had little knowledge. This accounts for the larger difference in the final

Table 15. Office Procedures Control Group Results - Concept #1.

Student	Completed Concept #1	Required Assistance	Uncorrected Errors Found	Deviated from Instructions
1	yes	no	no	yes
3	yes	no	no	no
5	yes	no	no	yes
7	yes	no	no	yes
9	yes	no	yes	yes
11	yes	no	no	yes
13	yes	yes	no	no
15	yes	no	no	no
17	yes	no	no	yes
19	yes	no	no	no
21	yes	no	no	yes
23	yes	no	yes	no
25	yes	no	no	yes
27	yes	no	no	no
29	yes	no	yes	yes
31	yes	no	yes	yes
33	yes	no	no	yes
35	yes	no	yes	yes
37	yes	no	no	no
Total	YES 19	1	5	12
Total	NO 0	18	14	7
Percent	YES 100	5.3	26.3	63.2
Percent	NO 0	94.7	73.7	36.8

Table 16. Office Procedures Experimental Group Results - Concept #1.

Student	Completed Concept #1	Required Assistance	Uncorrected Errors Found	Deviated from Instructions
2	yes	no	no	no
4	yes	no	no	no
6	yes	no	no	no
8	yes	no	no	no
10	yes	no	no	no
12	yes	no	no	no
14	yes	no	no	no
16	yes	no	no	no
18	yes	no	no	no
20	yes	no	no	no
22	yes	no	no	no
24	yes	no	no	no
26	yes	no	no	yes
28	yes	no	no	no
30	yes	no	no	no
32	yes	no	no	yes
34	yes	no	no	no
36	yes	no	no	no
38	yes	no	no	yes
Total YES	19	0	0	3
Total NO	0	19	19	16
Percent YES	100	0	0	15.8
Percent NO	0	100	100	84.2

Table 17. Business Machines Control Group Results - Concept #1.

Student	Completed Concept #1	Required Assistance	Uncorrected Errors Found	Deviated from Instructions
2	yes	yes	no	yes
4	yes	no	yes	yes
6	yes	no	yes	yes
8	yes	no	no	no
10	yes	yes	yes	no
12	yes	yes	no	no
14	yes	no	yes	yes
16*				
18	yes	no	yes	yes
20	yes	yes	no	no
22	yes	no	no	yes
24	yes	no	no	no
26	yes	no	no	no
28	yes	yes	no	no
Total YES	13	5	5	6
Total NO	0	8	8	7
Percent YES	100	38	38	46
Percent NO	0	62	62	54

*Student withdrew from class.

Table 18. Business Machines Experimental Group Results - Concept #1.

Student	Completed Concept #1	Required Assistance	Uncorrected Errors Found	Deviated from Instructions
1	yes	no	no	no
3	yes	no	no	no
5	yes	no	no	no
7*				
9	yes	no	no	yes
11	yes	no	no	no
13	yes	no	yes	no
15	yes	no	no	no
17	yes	no	no	no
19	yes	no	no	no
21	yes	no	no	yes
23	yes	no	no	no
25	yes	no	yes	no
27	yes	no	no	no
Total	13	0	2	2
Total	0	13	11	11
Percent	100	0	15.5	15.5
Percent	0	100	84.5	84.5

*Student withdrew from class.

results of the experimental and control groups.

Because of the difficulty of measuring student performance under sustained testing periods, the main factor evaluated was whether or not the student could successfully complete the concept without assistance. Of 19 students in the Office Procedures control group, 17 required assistance. This assistance usually consisted of correction of two or three moves which the student was not making correctly in operating the machine. Of 19 experimental students, six required some form of assistance. In the Business Machines class, all 13 of the control group required some assistance, while five of 13 experimental people needed help. These results are shown in Tables 19, 20, 21, and 22.

Hypothesis Testing

The research hypothesis tested in this study (stated in Chapter I) was:

> There will be a significant difference between experimental and control groups of students in a business class. The experimental groups, using new instructional concepts developed for the Audiscan system, and working without the assistance of an instructor, can complete two instructional concepts illustrating techniques of offset duplication. Their performance, measured by individual evaluation factors, will

Table 19. Office Procedures Control Group Results - Concept #2.

Student		Completed Concept #2	Required Assistance
1		yes	yes
3		yes	yes
5		yes	yes
7		yes	yes
9		yes	yes
11		yes	yes
13		yes	yes
15		yes	yes
17		yes	yes
19		yes	yes
21		yes	no
23		yes	no
25		yes	yes
27		yes	yes
29		yes	yes
31		yes	yes
33		yes	yes
35		yes	yes
37		yes	yes
Total	YES	19	17
Total	NO	0	2
Percent	YES	100	89.5
Percent	NO	0	10.5

Table 20. Office Procedures Experimental Group Results - Concept #2.

Student		Completed Concept #2	Required Assistance
2		yes	yes
4		yes	no
6		yes	yes
8		yes	no
10		yes	no
12		yes	yes
14		yes	no
16		yes	no
18		yes	no
20		yes	no
22		yes	no
24		yes	no
26		yes	yes
28		yes	yes
30		yes	no
32		yes	yes
34		yes	no
36		yes	no
38		yes	no
Total	YES	19	6
Total	NO	0	13
Percent	YES	100	31.6
Percent	NO	0	68.4

Table 21. Business Machines Control Group Results - Concept #2.

Student		Completed Concept #2	Required Assistance
2		yes	yes
4		yes	yes
6		yes	yes
8		yes	yes
10		yes	yes
12		yes	yes
14		yes	yes
16*			
18		yes	yes
20		yes	yes
22		yes	yes
24		yes	yes
26		yes	yes
28		yes	yes
Total	YES	13	13
Total	NO	0	0
Percent	YES	100	100
Percent	NO	0	0

*Student withdrew from class.

Table 22. Business Machines Experimental Group Results - Concept #2.

Student		Completed Concept #2	Required Assistance
1		yes	no
3		yes	yes
5		yes	no
7*			
9		yes	yes
11		yes	yes
13		yes	yes
15		yes	no
17		yes	no
19		yes	no
21		yes	no
23		yes	yes
25		yes	no
27		yes	no
Total	YES	13	5
Total	NO	0	8
Percent	YES	100	38.5
Percent	NO	0	61.5

*Student withdrew from class.

be superior to that of the control group, which did not use the concepts developed for the Audiscan.

Results of the testing (indicated in Tables 15-22) verify the hypothesis by showing the experimental groups performing better than the control groups, as measured by the evaluation factors. The evaluation factors and the results of each group are indicated (in percentages) in Table 23:

Table 23. Evaluation Factors, Concepts One and Two.

Evaluation Factors	Experimental	Control
Concept One		
Required assistance	00.0 BM*	38.0 BM
Required assistance	00.0 OP**	5.3 OP
Uncorrected errors found	15.5 BM	38.0 BM
Uncorrected errors found	00.0 OP	26.3 OP
Deviated from instructions	15.5 BM	46.0 BM
Deviated from instructions	15.8 OP	63.2 OP
Concept Two		
Required assistance	38.5 BM	100.0 BM
Required assistance	31.6 OP	89.5 OP

*BM Business Machines
**OP Office Procedures

Based on these findings, the research hypothesis is accepted as having proven that the experimental groups performed better than the

control groups in every category measured. The null hypothesis is rejected.

Explorations of the Study

At the time of the initial testing of the two concepts, it was not known what additional values might be obtained from observations being made during the evaluation period. The most noteworthy observation came from the members of experimental groups in their attitude toward the use of the Audiscan System as an effective means of instruction.

Students indicated they liked being able to work at their own pace and to have the instructional system available whenever it was needed. Many emphasized that the concepts, used as a follow-up to a lecture or demonstration, complemented the presentation given by the instructor. This is a significant factor in view of the fear often expressed by teachers that a new form of media will merely replace the teacher rather than add to the total effectiveness of the instructional program. In this study, the new instructional concepts are designed to improve the instructional process by relieving the instructor of repetitive teaching while improving the total effectiveness of the instructor.

At the completion of the evaluation period, students in the experimental group were asked to rate the effectiveness of the new

instructional media. These results are shown in Table 24.

Table 24. Results of Questionnaires.

Definitely not effective	Slightly less effective	Equal to traditional methods	Slightly better	Definitely much better
--	--	2	6	11
00%	00%	10%	32%	58%

Note: Results of questionnaire favor the effectiveness of Audiscan as opposed to traditional classroom techniques experienced by the Office Procedures' experimental group.

Table 25. Results of Questionnaires.

Definitely not effective	Slightly less effective	Equal to traditional methods	Slightly better	Definitely much better
--	--	--	5	8
00%	00%	00%	38%	62%

Note: Results of questionnaire favor the effectiveness of Audiscan as opposed to traditional classroom techniques experienced by the Business Machines' experimental group.

The percentage results of the two experimental groups, Business Machines and Office Procedures, are in close agreement about the effectiveness of the Audiscan.

CHAPTER VI

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The research study discussed and amplified in this paper consisted of the development and evaluation of two instructional concepts illustrating the procedures for 1) typing an offset master, and 2) duplicating offset copies. Each concept was prepared for use with the Audiscan projector, which utilizes a 16mm continuous loop filmstrip and synchronized sound tape. The medium requires individual student performance and participation.

The study was designed to determine whether students using the Audiscan (the experimental groups) could master the two concepts without assistance from an instructor and whether they could complete the required performance activities more efficiently than students not using the Audiscan (the control groups). Two experimental and two control groups were selected from a Business Machines and an Office Procedures class at Oregon State University.

Results of testing indicated that the experimental groups did complete the required performance tasks without the aid of the instructor. Evaluation factors indicate that the experimental groups were measurably higher in all categories evaluated. In addition, the

attitude of the students in the experimental groups was highly favorable; they preferred the use of the Audiscan and its self-contained concepts to the traditional lecture/demonstration presentation.

The development of concepts for the Audisan by the writer of this study demonstrates that it is possible for a classroom instructor to prepare instructional media of this type at a minimal cost, provided adequate facilities and technical assistance are available within the institution. If it is necessary to rely upon commercial firms for assistance in production, the costs can become prohibitive.

A follow-up study not part of the research project under discussion has just recently been completed. It was decided to determine the reactions of an experimental group from a small high school in Philomath, Oregon, to a program identical with that used in the initial testing. The results of this senior-level age group reveal that they were able to perform at a level equivalent to that of the experimental groups at the college level. The conclusion here is a key one: there is a strong indication that both high school and college students can learn effectively from the Audiscan and appropriate programs.

Conclusions

The results of this study provide evidence of the practicality of using the Audiscan media for individualized classroom instruction. On this basis, the following conclusions are drawn:

1. Instruction can be used for different age groups with no significant difference in the performance results of the student.
2. Instruction benefits the student by allowing learning to take place at any given moment, with or without the instructor.
3. Students are receptive to the method of instruction because it allows them to proceed at their own rate.
4. Instructional concepts designed for this study definitely relieved the instructor from repetitive teaching.
5. Instruction can only be effective if the quality of instruction is adequate and if it does not omit essential points that are vital to the performance of a task.
6. Programs are better if they are brief and require the student to respond continually with a given performance.
7. Programs may utilize cassettes, carousels, and so forth, to develop less expensive units, and to allow the program to be perfected before the final stages, which are the most costly to produce.
8. Writing programs enables the instructor to improve his instructional procedures; the final script will show only the perfection the writer demands.
9. Pilot testing of each program is essential.
10. There is an abundance of equipment available for programs of this type, but there is a real lack of available instructional

programs for use in the schools.

Recommendations

1. Continual development of single-concept programs should be made to free the instructor from repetitive teaching.
2. Continual development of single-concept programs should be pursued to provide quality instruction and to allow learning to take place at any given moment.
3. High school and college teachers should be provided with facilities and funds to initiate many additional programs of their own.
4. Business and industry should be contacted to assist in the financing and writing of programs which might also be of value to them in training their personnel.
5. Follow-up studies of students at the junior high school level should be made to determine their ability to utilize the same type of instruction.
6. Workshops and/or seminars should be conducted to assist teachers and even students to develop programs of instruction.
7. Comparison studies should be made by other teachers to determine the effectiveness of the Audiscan system.

EXHIBITS

Exhibit 1

Just use an offset eraser to make your corrections.

Quality and flexibility are two features of offset.
Quality and flexibility are two features of offset.
Quality and flexibility are two features of offset.

Quality and flexibility are two features of offset.
Quality and flexibility are two features of offset.
Quality and flexibility are two features of offset.

Quality and flexibility are two features of offset.
Quality and flexibility are two features of offset.
Quality and flexibility are two features of offset.

Offset is based on the principle that grease and water will not mix easily. Some methods of preparing a master are typewriting, drawing, writing, printing, or a special photographic means. One of the most common masters produced is the typewritten paper master. The completed master is placed on a cylinder which is revolved so it makes contact with rollers which moisten it. The greasy image on the master repels this solution and the rest of the area attracts it. Next, the master is rotated so that it makes contact with rollers carrying the ink. The master surface that has been moistened repels this ink while the grasy image accepts it. The master is then rotated to make contact with a rubber blanket cylinder. The inked greasy image is then "offset" to this blanket in reverse. The paper passes over this blanket and receives the image and is then ejected.

(Type your name here) (Type the current date here)

Exhibit 2

SERIES: Offset
TITLE: Typing an Offset Master

1 Welcome to your first lesson in offset duplication. In this lesson you will learn to type an offset master and to make corrections.

2 Your materials contain an offset master, an offset eraser, and a page with a typewritten paragraph. Check these three items. If any are missing, ask your instructor to supply you with the item before continuing.

3 It is important to note that only carbon and certain nylon ribbons will produce quality copy from an offset master. If you are using the typewriter designated by your instructor for offset typing, your...

4 Set your pressure control lever on three. This medium pressure setting will usually produce the best results.

5 Set your copy control lever for typing multiple copies. The lever should be pushed away from you. This is necessary because of the thickness of the offset master.

6 Set the left margin on 25.

7 Set the right margin on 95.

(Instructions noted in this section pertaining to photography. Script is then used in preparation for final taping in Audiscan cartridge.)

Exhibit 3

SERIES: Offset

TITLE: Duplicating Copies

1 Now that you have prepared a typewritten master, you will be guided through the process of running the offset machine and producing printed copies from your master.

2 Certain machine preparations have already been made to allow you to concentrate on running your master and nothing else. If your instructor has given you the go signal--proceed from here on your own.

3 Check the ink lever--it should be approximately half way on.

4 Check the water lever--it should be all the way on.

5 Check the counter dials--they should be on zero and the indicator pushed to the left.

6 Check the cylinder hooks to see if they are clearly visible. If not--turn the cylinder handle until they are. It is necessary to push in on the handle to engage it by turning the handle to your left or right...

7 Check the paper tray. It is desirable to keep a large quantity of paper in the tray to avoid running out while duplicating copies. For this master, only a small amount is required.

Exhibit 4

SERIES: Offset
TITLE: Typing an Offset Master

Slide	Script
1	Welcome to your first lesson in offset duplication. In this lesson you will learn to type an offset master and to make corrections.
2	Your materials contain an offset master, an offset eraser, and a page with a typewritten paragraph. Check these three items. If any are missing, ask your instructor to supply you with the item before continuing. STOP.
3	It is important to note that only carbon and certain nylon ribbons will produce quality copy from an offset master. If you are using the typewriter designated by your instructor for offset typing, your machine has the proper ribbon. When using a different typewriter in the future--be sure it has the correct ribbon. STOP
4	Set your pressure control lever on three. This medium pressure setting will usually produce the best results. STOP
5	Set your copy control lever for typing multiple copies. The lever should be pushed away from you. This is necessary because of the thickness of the offset master. STOP
6	Set the left margin on 25. STOP
7	Set the right margin on 95. STOP
8	Set the spacing lever for single spacing. STOP
9	Set the paper guide at the first white line on the left side of the paper scale. STOP

SERIES: Offset
TITLE: Typing an Offset Master

Slide	Script
10	Examine the offset master. Be careful to hold it by the outer edges. Fingerprints may cause smudges on your final copies. STOP
11	Locate the top edge of the master. It is not necessary to be concerned with the various markings across the top. STOP
12	Insert your master into the typewriter--using the paper release to straighten the copy. STOP
13	Place the rollers on the paper bail approximately 2 inches from the left and right edges of the master so they clear the line of typing. STOP
14	Note the line numbers in the left and right margins of the master. Use line 6 as your first line of type. It is not essential to be exactly on line 6, but approximately. STOP
15	Type this sentence, including the error, on line 6. STOP
16	Erasures are made with an offset eraser. This eraser will not damage the master unless you break through the surface by using too much pressure, or erasing too long in the same area. STOP
17	When erasing, use a light touch. The copy need not be erased clean; a light image should remain. Erase the error in your sentence using the offset eraser. STOP
18	It is important not to type over the correct letters in the word. Typing over correct letters adds extra carbon and your final copy will appear darker. Make your correction. From this point on you will be expected to correct your errors as you proceed. STOP

SERIES: Offset
TITLE: Typing an Offset Master

Slide	Script
19	Leave two or three blank lines after the sentence you have just completed and get ready to type the next sentence. STOP
20	Type this sentence three times. This will provide you with a means of comparing your copy with the sentences that will follow. STOP
21	The copy you have just completed has been typed with the pressure set on three. In most situations, three is ideal. Space down two or three blank lines. STOP
22	Set the pressure control lever on one. This pressure setting may result in light letters. STOP
23	Repeat this sentence three more times. STOP
24	Space down two or three blank lines. STOP
25	Set the pressure control on five. This is a heavier pressure setting and may tend to splatter the edges of the letters or push them into the master causing hollow characters. Neither result is preferred in offset typing. STOP
26	Repeat this sentence three more times. STOP
27	Examine the three groups of sentences. Which group appears to contain the sharpest copy? Words which contain light letters, hollow characters, or give a blurred image are not acceptable. These are usually caused by a high or low pressure setting. STOP
28	Also examine the back of your master. You may notice with a heavier pressure setting you can feel an impression on the back side by rubbing your finger lightly over the surface. This is not desirable. STOP

SERIES: Offset
TITLE: Typing an Offset Master

Slide	Script
29	Set your typewriter for double spacing. STOP
30	Return the pressure setting to three. Your first group was typed at three, the second group at one, and the last group at five. The number three setting should be very close to providing you with the best copy. If it does not look adequate to you, adjust your pressure accordingly. STOP
31	Space down two or three blank lines below your last group of sentences. STOP
32	Type the paragraph included in your materials. Remember to correct your errors as you proceed. STOP
33	Proofread your copy. STOP
34	Remove the master from your typewriter and take it to your instructor for evaluation. You will then proceed to the next lesson which consists of running several copies on the offset duplicator.

Exhibit 5

SERIES: Offset
TITLE: Duplicating Copies

Slide	Script
1	Now that you have prepared a typewritten master, you will be guided through the process of running the offset machine and producing printed copies from your master.
2	Certain machine preparations have already been made to allow you to concentrate on running your master and nothing else. If your instructor has given you the go signal--proceed from here on your own. STOP
3	Check the ink lever--it should be approximately half way on. STOP
4	Check the water lever--it should be all the way on. STOP
5	Check the counter dials--they should be on zero and the indicator pushed to the left. STOP
6	Check the cylinder hooks to see if they are clearly visible. If not--turn the cylinder handle until they are. It is necessary to push in on the handle to engage it by turning the handle to your left or right until it locks and the cylinder begins to turn. STOP
7	Check the paper tray. It is desirable to keep a large quantity of paper in the tray to avoid running out while duplicating copies. For this master, only a small amount is required. STOP
8	Should anything unusual occur during the process of running your master--and you panic--move the operating lever to the off position...

SERIES: Offset
TITLE: Duplicating Copies

Slide	Script
9	...or you may push the master switch off. Because we are ready to run this master, make sure this master switch is pushed on--now. STOP
10	Now we are ready to start. Place your master on a flat, clean surface, directly in front of you. STOP
11	The top edge of the master should be to your left. STOP
12	Fold a pad into quarters...
13	...and moisten it with the etch solution. Gently squeezing the bottle will force the fluid onto the pad. The color of etch that you are using may differ from that shown in this picture. Do not be concerned. STOP
14	From this point on, it is essential to proceed with as little hesitation as possible. Wipe quickly and thoroughly over the entire master moving from your left to your right. The etch cleans the master, removing fingerprints and dirt, and prepares the surface for the inking process.
15	Make a final sweep around the edges. STOP
16	Pick the master up in your right hand at the bottom, toward the middle...
17	...and place the holes appearing at the top of the master over the hooks on the cylinder. STOP
18	Place your left hand on the cylinder handle--turn it to your right. STOP
19	Continue to turn the cylinder handle to your right and keep your hand on the bottom of the master--pulling firmly. STOP

SERIES: Offset
TITLE: Duplicating Copies

Slide	Script
20	When the master has been wrapped around the cylinder--place your left hand on the bottom of the master exerting pressure against the master to keep it close to the cylinder. STOP
21	With your right hand, pull up strongly on the cylinder clamp and force the clamp into the slotted holes of the master. STOP
22	Take the pad with etch solution and again wipe over the entire master, starting at the bottom and working toward the top, turning the cylinder handle to your left.
23	
24	
25	STOP
26	When you reach the top edge of the master, pull out on the cylinder handle. STOP
27	Move the operating lever to the Number 1 start position. STOP
28	Push the start button.
29	After 5-10 revolutions of the cylinder, move the ink lever to the On position. STOP
30	After 5-10 revolutions of the cylinder, move the operating lever to the Number 2 ink On position. STOP

SERIES: Offset
TITLE: Duplicating Copies

Slide	Script
31	After 5-10 revolutions, move the operating lever to the Number 4 Run position and run several copies--letting up on the lever when you want to stop. STOP
32	If the ink on your copy appears to be too light--run a few more copies at the Run position. This slight pause allows sufficient ink to be distributed and will provide you with darker copies. STOP
33	If you notice smudges, fingerprints, or unusual ink marks on your master, do not attempt to do anything about it at this time. Your instructor will explain to you how to correct these.
34	Move the operating lever to the Number 4 Run position, keeping your hand on the lever with some pressure and run about 10 copies--counting to yourself. STOP
35	After the 10 copies have been run, release the operating lever and it will return automatically to the ink On position. If it does not return automatically, move it by hand to ink On position. STOP
36	At this point, if you were running a large quantity of copies, you would set the counter dial lever to turn off automatically at the completion of your run. Since you are running only a small number of copies, this step is not necessary at this time.
37	Return the ink lever to the Off position. STOP
38	Move the operating lever to Number 0 Off position to stop the machine. STOP

SERIES: Offset
TITLE: Duplicating Copies

Slide	Script
39	Remove your master from the cylinder. If the clamp is not visible, turn the cylinder to the point where it is possible to remove the clamp from the bottom portion of the master. STOP
40	Remove the master by continuing to turn the cylinder.
41	
42	STOP
43	Place the master on a flat surface. STOP
44	Free the cylinder handle by pulling it outward. STOP
45	Push the operating lever to the Wash (W) position and hold firmly in this position. STOP
46	Push the start button. STOP
47	Hold the handle in the Wash position for approximately ten seconds as it cleans the blanket. STOP
48	Release the operating lever--it will automatically return to the Off position. STOP
49	Turn off the master switch. STOP
50	Take your completed copies and master to your instructor for evaluation.
51	

BIBLIOGRAPHY

1. Allen, William H. Media stimulus and types of learning. Audio-visual Instruction, January, 1967, pp. 27-31.

2. Allen, William H. Trends in instructional technology. The Eric At Stanford 1970 Planning Report. November, 1970.

3. Audiscan Incorporated. Producer manual. Bellevue, Washington. November, 1969.

4. Banister, Richard E. Teaching by multimedia. Educational Media, May-September, 1969.

5. Bugelski, B. R. The psychology of learning. p. 457. N. Y., N. Y., Holt Publishing Co. 1956.

6. Carpenter, C. R. Psychological concepts and audio-visual instruction. AV Communication Review 5: 361-369. 1957.

7. Carver, Belford E. Systems concept in business education. Journal of Business Education, November, 1969, p. 157.

8. Dale, Edgar. Principles of learning. The News Letter. Columbus, Bureau of Educational Research and Service at Ohio State University, 1964.

9. Deletzke, Norman. Creating slide sets and film strips. Impact, 1970.

10. Finn, James D. et al. Studies in the growth of instructional technology I: audio-visual instrumentation for instruction in the public schools, 1930-1960: a basis for take-off. National Education Assoc. Washington, D. C. 1962.

11. Gagne, Robert M. The conditions of learning. New York, Holt, Rinehart and Winston, Inc., 1965.

12. Hunt, Ronald L. The schools, industry, and new knowledge. Audio-visual Instruction, March, 1964, pp. 162-165.

13. Hutchings, Robert. Manager, Advertising Department, Office Products Division, International Business Machines, New York, New York. Address to the 100 Percent Club, Miami, Florida. April, 1966.

14. Ivarie, Theodore. A learning system for offset duplication. Business Education Forum, May, 1969, p. 22.

15. Kemp, Jerrold E. Planning & producing audiovisual materials. Second edition. Chanbler Publishing Co., Scranton, Pennsylvania, 1968, p. 15-18.

16. Littlefield, C. L., and Frank Rachel. Office and administrative management. Englewood, Prentice-Hall, Inc., 1965, p. 201.

17. Mager, Robert F. Preparing objectives for programmed instruction. Fearon Publishers, San Francisco, 1962.

18. McKim, J. W., Theodore C. West and William T. Stickley. Short films for self-instruction in biomedical education. A paper presented at the University of Washington, Seattle, Washington. 1963.

19. McVey, Gerald F. Multimedia instructional laboratory. Audiovisual Instruction, February, 1966. pp. 80-85.

20. Socony-Vacuum Oil Company. Privately circulated study, New York City. 1962.

APPENDICES

APPENDIX A

Recent Media Developments (15)

The mid 1950's have been established as the beginning of modern developments in instructional technology (10)--that area of endeavor that has brought machines, materials, and techniques together for educational purposes. Many of these developments have bearing upon presently emerging new instructional patterns and the media roles that serve them.

One of the most influential media of communication is television, including both instructional (for direct classroom learning) and educational (for cultural and community enrichment). The medium has extended the influence of the 16mm film so as to reach students with up-to-date topics and with newly organized approaches to subjects. The detailed planning incident to television instruction, plus its potential for efficiently incorporating most other audiovisual materials within its format, has made many educators aware, for the first time, of a way to approach instruction systematically with audiovisual materials.

One important result of television has been to make available complete courses presented by one or more subject experts in a series of 100 to 160 thirty-minute programs (films). The film courses, with their up-dating of subject content, have contributed to a re-examination of most subject fields. The results have been the

development of new course structures, primarily in the sciences, social sciences, and mathematics, and the availability of new texts, manuals, and correlated visual materials (mainly films.)

In recent years, more overhead projectors have been purchased than any other type of audiovisual equipment. With these, the teacher, at the front of the room, can turn from the blackboard and face the class--to explain or show--an important psychological component in the relationship of teacher with students. Simple but effective techniques are available for using the overhead projector to present information at the best pace for the class.

Language laboratories have applied the potentials of magnetic tape for instruction to groups and individuals. Today extensions of the language laboratory are found in remote-control electronic equipment like dial-access systems. Some marvels of equipment development now permit pushbutton random-accessing of information in many forms. These "hardware" items have developed spectacularly. But the "software" (the instructional materials for use with the equipment) has not always developed along with the "hardware."

A particularly impressive instance was the teaching-machine movement, which introduced various devices but very few programs to be used with them. Recently, the term <u>teaching machine</u> has given way to the expression <u>programmed</u> instruction (a term for process <u>with</u> materials). The emphasis is now on carefully designed and

tested materials to serve specific objectives.

Reasonably priced equipment for slide projection is now available. Remote-controlled slide projectors are commonplace. Slides are held in trays or drums and proper sequencing is guaranteed. Also, simple-to-operate slide-making cameras are here, and tape recorders, for synchronization with slide projection, can be had. Teachers have gained the confidence to use these types of equipment in developing materials for their own specific teaching purposes.

In addition, there have been developments in the motion-picture field. Self-threading 16mm projectors make film use easier. But, the biggest potential lies in the 8mm field. One outstanding development is the cartridge projector with its simplicity of operation. This opens many possibilities for independent study and demonstrates that the motion picture does not have to be at least 10 minutes long or cover a whole chapter of a textbook. Short "single-concept" films serve to illustrate a particular skill or process and thus put learning right at the level and pace of the student. The development of the Super-8 format has brought 8mm film quality near to the level of 16mm film, and optical and magnetic sound for 8mm will lead to further instructional potentials.

Besides these noteworthy technological developments (and there are many more that cannot be included in this brief survey), there are other important areas to recognize along the trail leading to the

emerging future. One is the "cross media" or "multimedia" presentation. These terms refer to the simultaneous or sequential use of a number of visual and audio materials. The visuals may be in the form of slides, motion pictures, and/or overhead transparencies. These may be controlled remotely by the presenter or may be run automatically on cue. In projection this method is typified by the presentation auditorium in which two or three images (no more, we hope!) are shown simultaneously for large groups. The planning and "programming" for such presentations are extensive and, to date, have been successful in only a few situations (19).

Another less ambitious use of the multimedia concept is in the development of "kits" of materials, organized around a single topic. Such a kit contains a variety of materials--filmstrips, recordings, still pictures, concept films, worksheets, printed booklets, and even real objects. Many are now available, such as those on a country (Mexico), a process (bread making), a concept (water pollution), and those providing lessons in foreign languages. They are being developed commercially and also locally, as in the San Diego Community Resources project (12) wherein local industries and scientific institutions cooperate with the schools to produce materials that are too current to be available any other way.

On the horizon are the applications of computers to instruction. Already computers are used for such activities as record-keeping and

scheduling, counseling, simulating learning environments for instruction, storing and retrieving information, and publication work. Research is being conducted to determine how computers and media can best be adapted for direct instruction to individuals.

In summary, technological advances in the last ten to fifteen years have been extensive in providing improved devices and techniques for bringing the best, most relevant, and widest range of experiences to students. It has been shown that the use of various media can improve student learning and at the same time significantly reduce instructional time and some personnel requirements.

It should be evident that audiovisual and related educational media are proving to be far more than aids. Media of these kinds are often the vanguards of change in education and, when properly considered, they can affect the development of curriculum and influence the learning process itself. They are essential to effective communication for direct instruction in many independent-learning programs.

But, along with the positive results of instructional technology, some important concerns must be recognized. Admittedly, some setbacks and negative results have been connected with the introduction and trial of new resources. In some situations the proponents of major types of audiovisual materials operate in isolation, separated from each other, and ignore other components of the instructional environment. This aloofness has been in some degree characteristic

of educational television, programmed instruction, and complete film courses. It produces inefficiency, waste, duplication, and in some of the products, a sad lack of purpose and quality.

There are strengths and weaknesses in all media. The possible integrated use of media, so that each may serve for its best specific purposes, seems to offer much potential for instruction. We have a technological capability for making great strides in reaching toward educational goals. Instructional media, if carefully planned, selected, produced, and used within an over-all pattern, can become key elements in such developments.

APPENDIX B

Summaries of Research Findings

Summaries of research findings, including production elements, have been prepared by a number of writers. From these summaries, the findings relating to production aspects of audiovisual materials are abstracted and presented in this chapter (15).

Hoban and Van Ormer (1950)

In 1950, Hoban and Van Ormer (Instructional Film Research, 1918-1950) surveyed a large number of experiments and other studies that had been made in the previous 30 years concerning the instructional values of motion pictures. Among their findings were some directly relating to variables in film production. Most of these points are also of value in the production of other materials, such as slides and filmstrips. Only the briefest summary statements of the detailed explanations are included here:

Camera angle. A performance should be shown on the screen the way the learner would see it if he were doing the job himself (subjective camera position).

Rate of development. The rate of development or pacing of a film should be slow enough to permit the learners to grasp the material as it is shown.

Succinct treatment. Presenting only the bare essentials or presenting too rapid coverage of subject matter may be very ineffective.

Errors. The learning of performance skills from films will be increased if common errors and ways to avoid them are shown.

Repetition. A film should be organized so that important sequences or concepts are repeated. Repetition of films, or parts within a film, is one of the most effective means for increasing learning.

Organizational outline. Films which treat discrete factual material appear to be improved by the use of an organizational outline in titles and commentary.

Introduction. Relevant information and what the viewer is expected to learn from the film should be presented in an introduction.

Summary. The important points should be summarized in the film in a clear, concise manner. Summaries probably do not significantly improve learning unless they are complete enough to serve as repetition and review.

Visual potentialities. Effective advantage of the motion picture medium can be taken by using its ability to show motion, to speed-up motion and slow it down, to telescope and otherwise control timing of events and processes, to bridge space, and to organize events and action.

Picture-commentary relationship. The commentary of a typical informational film appears to teach more than the pictures of that

same film, when learning is measured by verbal tests. This observation does not necessarily mean that the commentary has greater inherent effectiveness than pictures; it may mean that producers rely more heavily on commentary than on pictures or on the optimum integration of the two. With films designed to teach performance skills, where learning is measured by nonverbal tests, the pictures appear to carry the main teaching burden.

Concentration of ideas. Ideas or concepts should be presented at a rate appropriate to the ability of the audience to comprehend them.

Commentary. The number of words (per minute of film) in the commentary has a definite effect on learning. Care should be taken not to "pack" the sound track. Application of readability formulas to improve a commentary may not do so.

Use of personal pronouns. The use of direct forms of address (imperative or second person) in film commentaries is advised, but use of the passive voice is not.

Nomenclature. Introduction of new names or technical terms in a film imposes an additional burden on learners, and may impede the learning of a performance skill.

Special effects. Special effects used as attention-getting devices have no positive influence on learning.

Optical effects. A film in which straight cuts have replaced optical effects (such as fades, wipes, and dissolves) teaches just as effectively as a film which uses these effects.

Color. Experimentation has not yet demonstrated any general over-all increased learning as a result of using color in instructional films.

Music. Preliminary experimentation suggests that music does not add to the instructional effectiveness of an informational film.

Pretesting. Scripts, workprints, demonstrations, and final prints can be evaluated quickly using the learning-profile method of film evaluation, which requires a group of trainees to estimate their own learning.

Film loops. Short film loops, which can be repeated continuously (without a break for reloading) as many times as desired, appear to be useful for teaching difficult skills.

Participation. Learning will increase if the viewer practices a skill while it is presented on the screen, provided the film develops slowly enough, or provided periods of time are allowed which permit the learner to practice without missing new material shown on the screen.

Dramatic sequences. Incorporation of dramatic sequences such as comedy, singing commercials, or realistic settings in films to teach factual information have not been shown to improve the film.

Filmograph. Filmographs, which incorporate still shots rather than motion, may be equally effective and less expensive.

Visual recordings. Films may be produced to make a visual recording of a task that may be difficult to describe with words alone.

Inexpensive films. Because color, optical effects, and dramatic effects have little to do with increasing learning from films, it is possible to eliminate them. Films prepared in this manner can be made inexpensively and can be produced quickly.

Saul (1954)

Another review of literature, relating this time to graphic training aids, was done in 1954 under the direction of Ezra V. Saul (A Review of the Literature Pertinent to the Design and Use of Effective Graphic Training Aids). The objective of this report was to "prepare annotated reviews of the literature in specific areas pertinent to the problem of developing standards and criteria on the design, preparation, and utilization of effective graphic training aids."

Materials for the report were derived from the literature on psychophysiology of vision, visual perception, experimental aesthetics and art, advertising, visual education, psychology of learning, engineering drawing, and instructor utilization of graphic materials. Many of the reports are valuable for such findings as relate to design principles, uses of color, and graphic depiction of relationships, to

mention just a few. Evaluations of findings are provided at the end of each section, but no generalized factual summaries are made from which specific principles can be drawn.

May and Lumsdaine (1958)

Between 1946 and 1954 a series of experimental studies concerning problems in production and utilization of teaching films were conducted under the Yale Motion Picture Research Project (Learning from Films). Some findings correlated closely with the results reported by Hoban and Van Ormer in these categories: concentration of ideas, color, music, participation, and dramatic sequences. In addition, other findings were:

Pictorial quality. A crude presentation (pencil sketches of visual aids) may be at least equal in effectiveness to a polished color film.

Live dialogue and off-stage narration. Except where the use of live dialogue can have marked superiority for meeting particular objectives, the narrated film has great advantages.

Printed titles and questions. Liberal use of titles, questions, and other printed words can improve teaching effectiveness.

May (1965-1966)

A different approach to reporting research results was taken in

May's series of papers (Enhancements and Simplifications of Motivational and Stimulus Variables in Audiovisual Instructional Materials (1965); The Role of Student Response in Learning from the New Educational Media (1966); Word-Picture Relationships in Audio-Visual Presentations (1965) for the United States Office of Education. He examined selected areas of instructional variables as they related to the production of audiovisual materials. These were treated from the standpoint of the functions they perform for motivating, reinforcing, cueing, and simplifying the responses that are required for learning.

Motivators are devices, effects, and procedures that cause the learner to pay close attention, to look or listen for relevant and crucial clues, to have a "set" or put forth effort to learn, and to respond or practice. Positive motivators may include the use of color (to gain and hold attention); dramatic presentations; humor and comic effects; and inserted printed questions.

Reinforcers are techniques to increase the probability that the learner will remember and can reproduce what was presented. There are no clear indicators of ways to accomplish this increase, but there is evidence that stimuli in materials that are pleasing, interesting, and satisfying are positive reinforcers.

Cue identifiers are devices and effects that help the learner identify and recognize the relevant cues. These include color, arrows and pointers, animation, "implosion" techniques (having

assembled parts fall into place without being handled by the demonstrator), subjective camera angles, and directed narration.

Simplifiers are procedures for making presentations more effective. They include improving the readability of narration, eliminating irrelevant pictorial materials, repeating illustrations or adding additional illustrations, or using filmstrips or filmographs (still pictures or diagrams on motion-picture film) in place of live film action for some purposes.

In this review, May, as did other writers, indicated that some techniques did little or nothing to improve learning in audiovisual materials. These included musical backgrounds, and optical effects for transitions (fades, dissolves, and wipes). There is divided opinion about the value of introductory and review sections.

Travers (1967)

In 1964, Travers, a psychologist, made available an interim report on his project, sponsored by the United States Office of Education. This preliminary report, with additions, was the basis for Travers's Research and Theory Related to Audiovisual Information Transmission (1967). His purpose was to search the literature relating to the transmission of information through the senses and to point out implications for the design of audiovisual materials. This report differs from that of Hoban and Van Ormer in two ways. First,

Travers examined reports of psychology-oriented studies and those involving motion pictures as well as other media. Second, the majority of the studies described by Travers were performed after 1950, whereas the Hoban and Van Ormer report included studies from 1918 to 1950.

Here are the major findings reported by Travers:

Embellishments and simplifications. The fact that color adds to the attractiveness of a training device does not necessarily mean that it improves learning. Black-and-white is as effective as color for instructional purposes except when the learning involves an actual color discrimination. Learners prefer color versions, despite the fact that the addition of color does not generally contribute to learning.

A demonstration should include only the basic elements of what is to be demonstrated, but oversimplification can have a deleterious effect.

The special effects (fades, dissolves, and the like) that are used to represent lapses of time and other events are not effective in conveying intended meanings. Printed titles seem to be more effective in conveying intended meanings. Special sound effects appear to be much more challenging to the film producer than helpful to the learner. The same can be said of humor and of other special methods intended to retain the interest of the learner.

Audio readability, density of information, and rate of presentation. Verbal simplification in film commentaries increases teaching effectiveness. Comprehension of audio inputs can be predicted by readability formulas to measure their difficulty.

Some verbalization is better than none, but there is no optimum amount. Slow speeds for transmitting verbal information are favored, but they can be too slow.

If time is not a factor, listening comprehension is likely to be most effective at speeds of around 160 words per minute. This generalization is probably true only for relatively simple material, so the intellectual level of the audience must also be taken into account. When narration is accompanied by video, the optimum rate of the narration appears to be slower.

Audience participation and practice. Overt (visible) response, practiced by the learner during the film, results in increased learning.

Furnishing knowledge of results as part of the participation process also has positive effects upon learning.

Activities related to the presentation of a film indicate that learners experience difficulty in following a continuous demonstration and, at the same time, undertaking the task themselves. But when the film or other continuous flow of information is stopped, and the learner then participates, learning is more effective. Participation

does not have to be overt. Mental practice is as effective.

In 1966, Travers completed his project, including a series of experiments designed to investigate the validity of certain accepted elements in the design of audiovisual materials. On the basis of the results of his experiments, he builds a useful case for presentations by means of a single sense with this conclusion:

> The simultaneous use of two senses (visual and audio) are likely to be of value only when the rate of input of information is very slow. The silent film with the alternation of picture and print would appear to find much theoretical support as a teaching device.

Hartman (1961)

This matter of single versus multiple channel presentation is of particular importance when attention is being given to 8mm silent and sound film production. Hartman ("Single and Multiple Channel Communication: A Review of Research and a Proposed Model") had reviewed the literature to date on single and multiple channel communication and concluded with these two points:

The meaning of a visual message is often ambiguous and subject to personal interpretation. The use of words to direct attention is essential.

The audio channel is much more capable of obtaining attention if it is used as an interjection on the pictorial channel rather than being continuously parallel with the pictorial.

Gropper (1966)

Finally, the relation of visuals and words for developing programmed audiovisual materials had been studied by Gropper ("Learning from Visuals: Some Behavioral Considerations"). He found that:

While concepts and principles can be acquired on the basis solely of visual presentations, to rely only on visual lessons is inefficient. Gropper concluded that words serve an important cueing role and should be incorporated, for this secondary purpose, into a visual presentation.

APPENDIX C

Film Production for the Audiscan Projector

The film production project is probably the most difficult phase to complete without assistance from qualified personnel in audiovisual departments or commercial firms specializing in film production. The information presented in this section must be followed specifically, regardless of whether the writer completes this portion or contracts with a business firm. The main references in this chapter are credited to Audiscan Incorporated (3).

Film Stock

Audiscan Projectors are designed to use standard, silent 16mm double perforated print stock, loaded emulsion side out (toward the projection lens, i.e., A-wind or print position). This is the preferred position.

Planning the Production

Care must be taken when planning the production to be sure that the final print will read correctly when viewed through the outside radius of the film loop.

Original material to be copied should have a horizontal format, 3 to 4 proportion, sharp and lower than normal in contrast.

Aperture and Cut-off

The Audiscan System uses a 16mm standard silent projection aperture. The full aperture is not projected on the screen, consequently allowance must be made for cut-off as follows:

Art and transparencies must be planned so that all desired subject matter falls within the standard T. V. cut-off format with background bleeding to the projection aperture. When using a field size guide, follow these specifications:

If shooting this field size, bleed background to this field:	Keep desired subject matter inside this field:
12	10
10	8.25
8	6.5
6	5

This progression can be carried farther in either direction. (For actual measurements see Illustration 2).

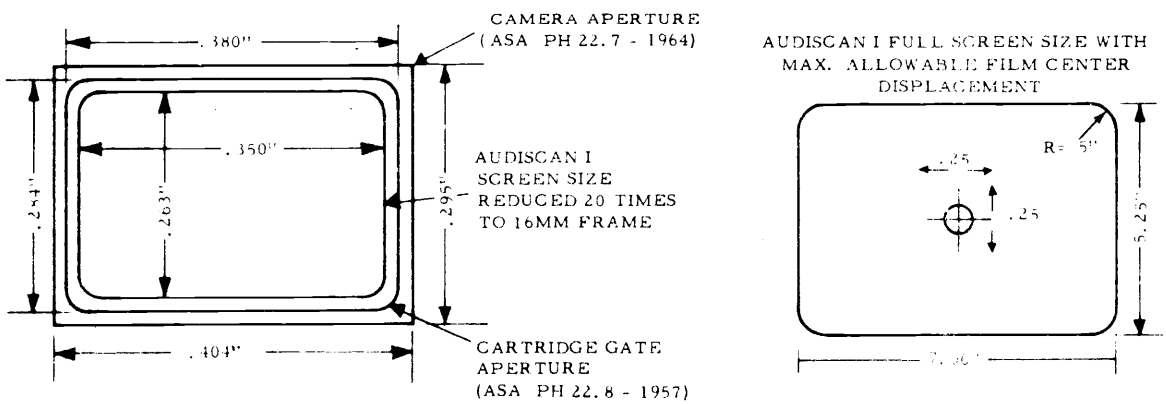


Illustration 2. Audiscan Gate, Aperture and Screen Measurements.

Producing the Filmstrip

The following production methods have been used and yield 16mm filmstrips of good quality.

Contact Printing. 16mm to 16mm

A. Ektachrome #7255 original-- print to Eastman #7388 or #7387 print stock.
   #7255 may be used to hold down contrast.
B. Eastman #7251 original negative-- print to Eastman #7385 print stock.

Optical Reduction Printing. 35mm to 16mm

A. For Flat Art use Eastman #5251 negative master-- reduce to Eastman #7385 print stock.
B. For Transparencies use Eastman #6008 negative master-- reduce to Eastman #7385 print stock.
C. From existing 35mm Filmstrips print to #7255 if possible.

Mixed art and transparencies may be shot on either #7251 or #5251 if opaque art exceeds transparencies, but the transparencies should be contrast masked. If transparencies exceed opaque art, convert art to transparencies and shoot on #6008.

In all cases, if long print runs or repeated print orders are anticipated, an internegative of interpositive should be used as a printing master to prevent damage to the camera original. Proper planning will allow ending up with a print in A-wind or print position. (Because all Audiscan units have fine focus, the print may be loaded in either position but A-wind is preferred.)

Final Print

The Audiscan Cartridge will take a 40 frame minimum loop length. If the production contains less than 40 frames, then it must be duplicated enough times on the final loop to bring it past the minimum limit. Each sequence must be separated by two black frames to correspond with the spliced section. An overlap splice is recommended for use in the cartridge and one black frame should be on either side of it, otherwise the splice will be visible and one of the frames adjacent may be out of focus. The splice itself must be flat to insure good focus on nearby frames and allow it to pass easily through the gate. (See Illustration 3). Also the splice must be dry when film strip is loaded to prevent buckling in the cartridge. Some splicers need a larger loop, so treat accordingly. The maximum number of frames that may be loaded into one cartridge is about 225.

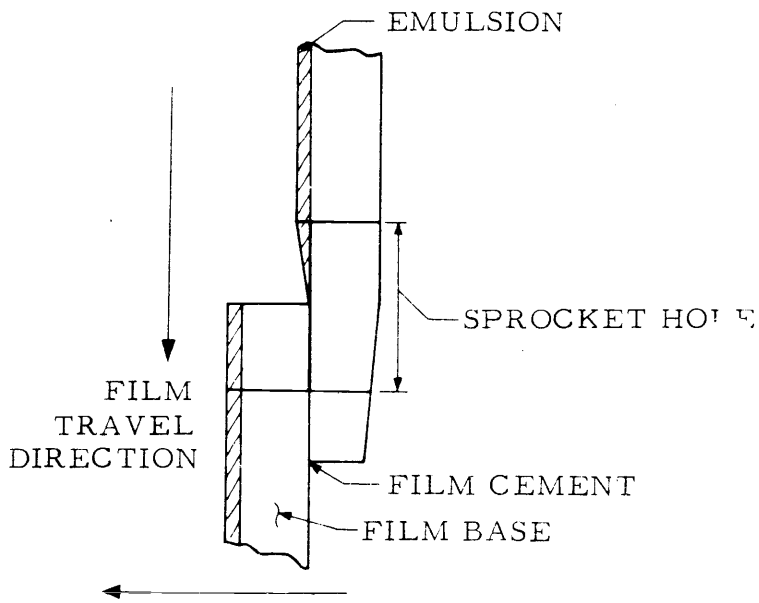


Illustration 3. Film Overlap Direction.

Treating the Film Loop

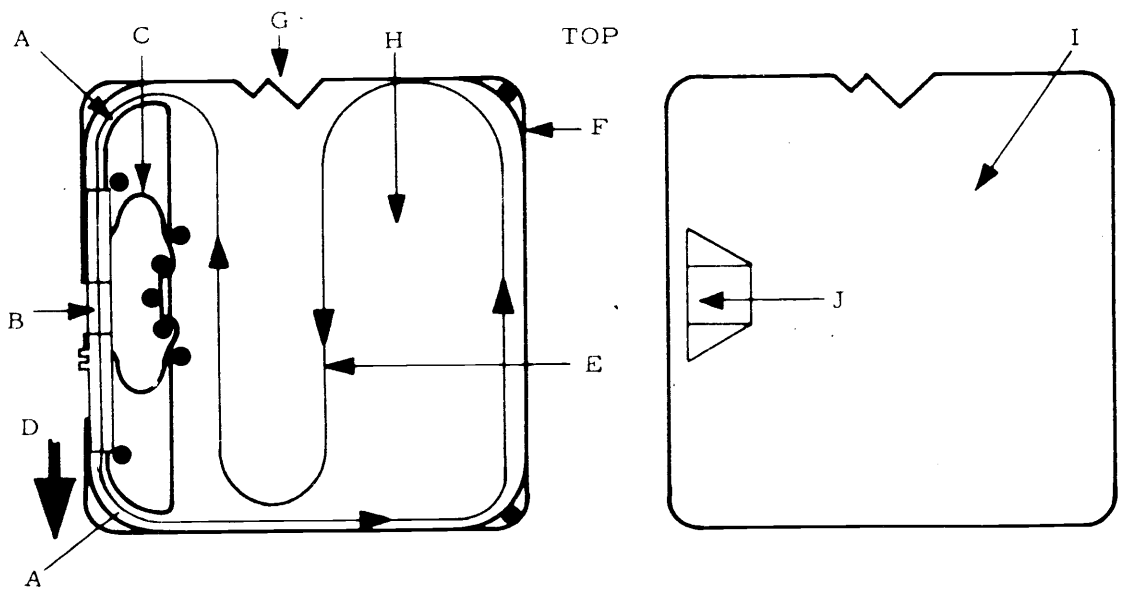
For loops of less than 60 frames, normal waxing or film hardening is sufficient to give extended life to the film strip. On longer lengths, a more substantial treatment must be used to guard against abrading the film as it rubs against itself. The least expensive, most satisfactory treatment tested is to immerse the loops in FILMAGIC SURFASET for a few minutes, stack the film loops, allowing them to dry somewhat, wipe with Filmagic silicone cloth, and finally, wipe the film with a slightly moist sponge before loading. An added advantage is that this treatment will cure green film and help prevent popping.

Loading the Film

(Refer to Illustrations 4 and 5.) Insert film loop (E) between the halves of the film-advance gate (B) by gently pressing back on inside half of gate. Be careful not to distort spring (C). Film is inserted with pictures upside down with reference to the top (G) of cartridge. If the film has been made and inserted properly, the picture will appear correctly when viewed through the aperture with the cartridge held upside-down.

Film travels in direction (D). Align film loop in film guide channels (A), then fold or roll remaining film loop into compartment (H). Configuration of this folding is not critical. Make sure the

gate retaining spring (C) is still in its original position (i.e., when looking toward gate from rear of cartridge, spring should pass behind inner small studs and in front of outer small studs located on ridge separating film compartment from gate area). Carefully close film compartment with cover (I) aligning mirror (J) with film advance gate (B). Be careful not to crush film with cover. Hold cover in place firmly and actuate film gate manually to see that the film runs freely.



Illustrations 4 and 5. Audiscan Cartridge-Film Compartment.

Tape Specifications

The tape loop in the Audiscan cartridge uses graphite lubricated, 1/4 inch, 1 mil, one side tape made for continuous loop cartridges. Examples would be: Scotch #154, Audiotape #1743 or #1761.

Tape Master

Audio masters may be made on any good quality recording tape. Music and sound effects may be used to good advantage, since the tape transport in the Audiscan Projector has low wow and flutter levels. If audio material is taken from a phonograph record, it should be re-recorded on a tape master and any unnecessary noises (such as audible picture change gongs) deleted. Only when the audio portion of the tape master is in its final form should the picture advance signals be added. Pulse signals should never be recorded at the same time as the audio portion.

"Programmer" and "Producer" Card

Audiscan Incorporated provides, at nominal cost, a "programmer" and a specially modified switching card with a jack on it. This "producer" card, when inserted into any regular AUDISCAN I series Projector, will allow the projector to be advanced from an outside signal source. This is not a recording modification; it simply taps into the pulse amplifier to feed an external signal into the machine for film advance and stop.

Recording the Master

To utilize the "Programmer" properly, a two channel recorder

with 1/2 track head must be used. Connect the equipment as shown in Illustration 6.

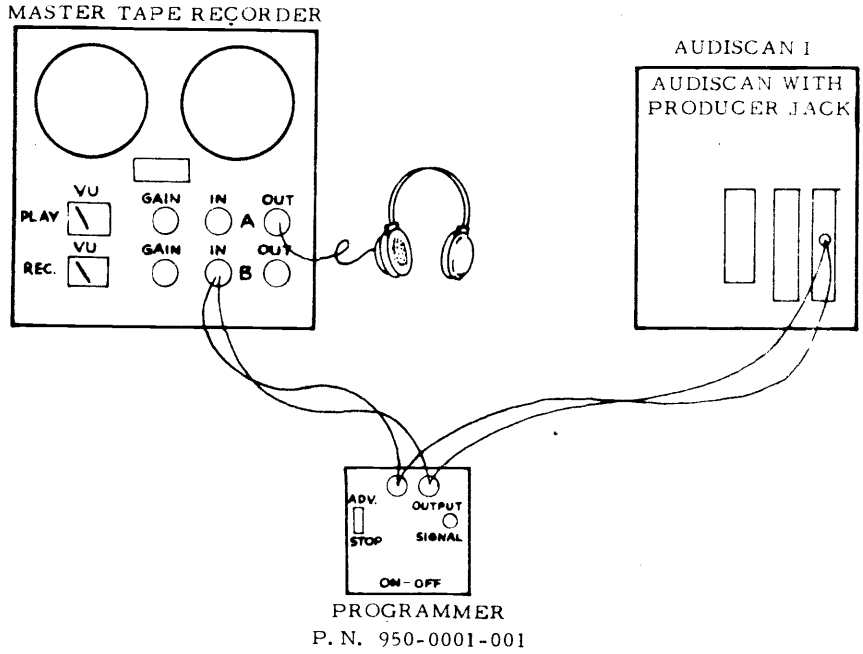


Illustration 6. Master Tape Recording.

As illustrated, the "Producer" card in an Audiscan Projector, the "Programmer" and the two channel tape recorder are all connected together. Insert a cartridge, loaded with the film only, into the projector. Load the dual channel tape recorder with the master tape recorded with the audio track in its final form. Turn on the equipment and push the "Programmer" advance signal button several times to check the set-up. If everything is working correctly, the Audiscan Projector will advance when the "Programmer" advance button is pushed, and the V.U. meter on the recorder (Channel B only) will indicate. At this point, when making the master, no specified signal

levels need be followed as long as good recording practice is observed.

Procedure to be Followed

Switch recorder Channel A to playback, Channel B to record, and start recorder. While following the written script, depress advance button once for every change of visual. Button can be held down for any length of time, since the pulse length is automatically controlled by the "Programmer."

Checking the Master

Switch both recorder channels to playback and disconnect the "Programmer." Connect Channel B from tape recorder to the jack on the Audiscan Projector. An output of 3. V p-p will be necessary to drive the 70K ohm impedance jack in the projector. Rewind the tape master, advance film loop manually to first black frame and start the recorder. The Audiscan Projector will now operate correctly--going through the sequence and shutting off at the end. During this playback, the master can be checked for cue signal timing and any changes made before duplicating.

Correcting the Master

If portions of the master track B must be erased and rerecorded,

it is necessary to use a recorder that does not leave large noise spikes on the tape when the recorder is switched from playback to record. Although the Audiscan Projector will not react to very short noise spikes (0.1 second or less), best results will be achieved if the signal to noise ratio is kept high.

On most professional recorders, the recording head precedes the playback head by an inch or so, and you will be recording the cue signal in advance of where you think it's going to be, causing the picture to advance somewhat later than intended. This is more pronounced at slower tape speeds, and it is recommended that the master be recorded at a minimum speed of 7-1/2 i.p.s.

Stop Motion

The "Programmer" has another automatic feature which allows programming of stop motion up to five frames per second. For cue-in sequences of one or more visual changes per second, the pulse duration must be shortened to allow the film advance actuator to return to its normal position for the next stroke. The change of rate of advance requires the pulse duration to change in a controlled manner for noise immunity purposes. (See Illustration 7). This projector advance speed is matched by the "Programmer" automatically and therefore will allow film change to proceed up to five frames per second.

Tape Duplicating

Make sure that the signals, audio and cue, are recorded at the proper level. The Audiscan cue signal level is standardized to 9. db below saturation of Scotch #111 tape at 1. KHz and 3.75 i.p.s. This means that on a tape recorder with a V.U. meter, calibrated such that it reads 0. db on playback of the above tape at 3.75 i.p.s., the Audiscan advance cue signal shall be a minimum of -9. db.

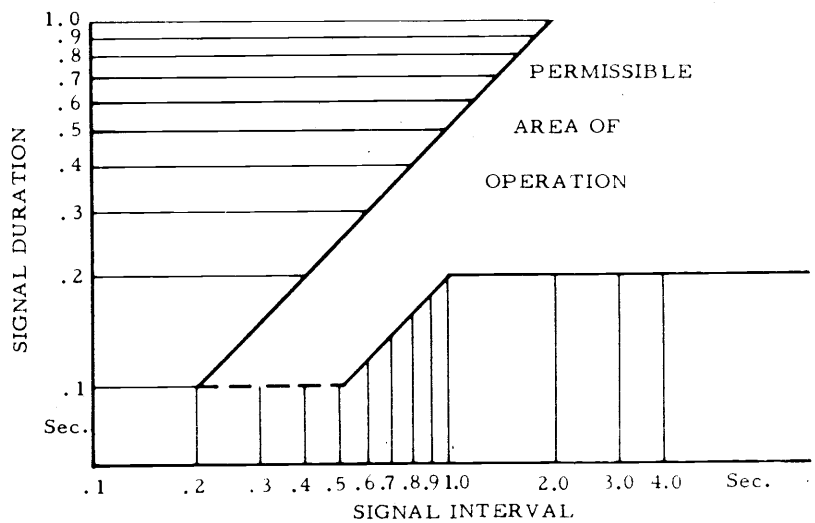


Illustration 7. Rate of Advance.

Tape Winding

The tape is wound with oxide facing out and in such a direction that when the tape is pulled out of the center, the reel will turn clockwise. (See Illustration 8.) Rewind recorded tape, with signals, on the Audiscan Cartridge tape-reel, using an 8" to 12" leader. Use a

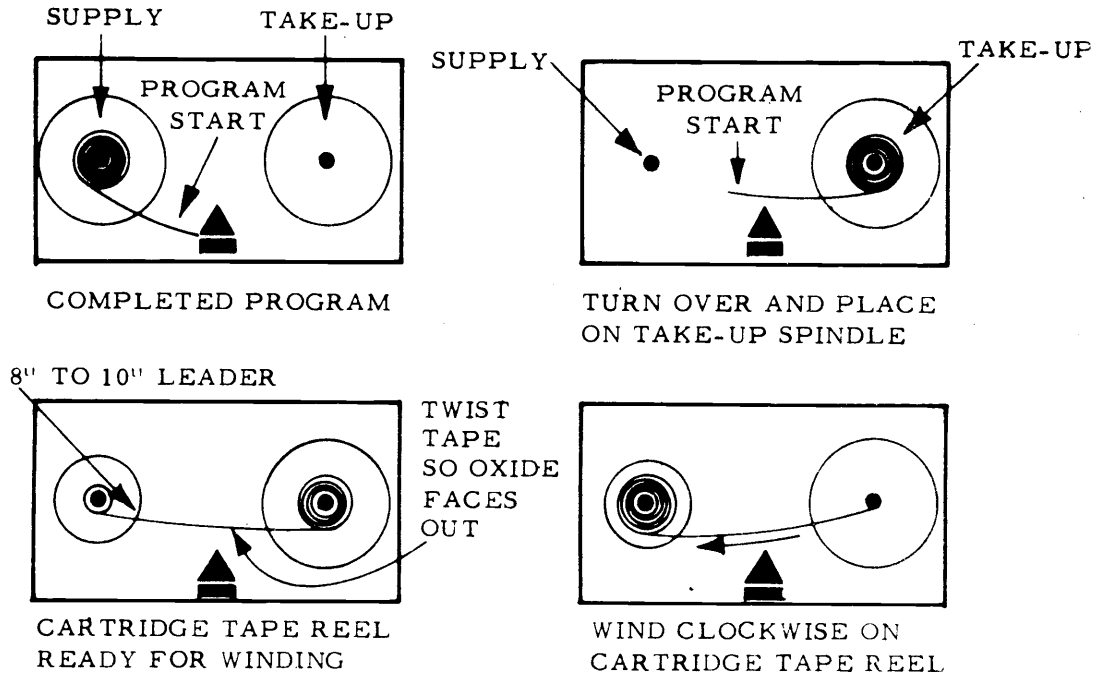
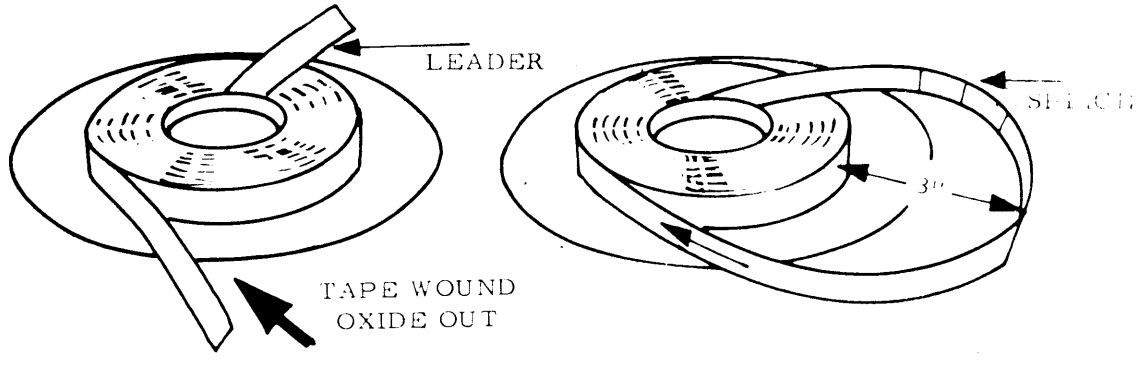


Illustration 8. Tape Winding.



Illustrations 9 and 10. Tape Leader.

longer leader with a small amount of tape and a shorter leader with a large amount of tape. Begin winding tape with start next to the tape-reel and oxide surface facing out.

When tape is wound, pull leader out, cut and splice it leaving a loop of approximately 2-1/2 to 3 inches. (See Illustrations 9 and 10.)

Tape Tension

(Refer to Illustration 11.) The tape should be pulled until it starts to squeak, as a check of wind tension. For Scotch #153, there should be one inch of loop for every minute of program. Scotch #154 requires slightly less tension, about 1-1/2 inches of loop for every minute of program. These measurements are not absolute, but are guides for normal cartridge assembly.

Either side of the tape may be used for splices. Good quality, pressure sensitive splicing tape and careful trimming will prevent jammed cartridges.

Loading the Tape

(Refer to Illustrations 12 and 13.) Depress brake-arm-spring (D) by gently squeezing the spring end of the tape-roller-arm assembly (E) and insert tape-reel (A) over the stud (B). Lift tape and position the tape-guide (I) so that studs on the underside engage their receptacles (G & J). While positioning the tape-guide, position the

tape on the outside of studs (H & G) and the tape-roller (F). Once again depress the brake-arm-spring, releasing the tape-reel and gently rotate clockwise to take up any excess tape slack. Place tape compartment cover (Illustration 12) over tape compartment so that notch (K) lines up with the tape-roller (F). Insert the four screws in holes (C) and gently tighten cover. Since the screws engage studs on the film compartment cover, both covers will remain secure and seal the cartridge.

Once film and tape are spliced, loading the cartridge should not take longer than one minute.

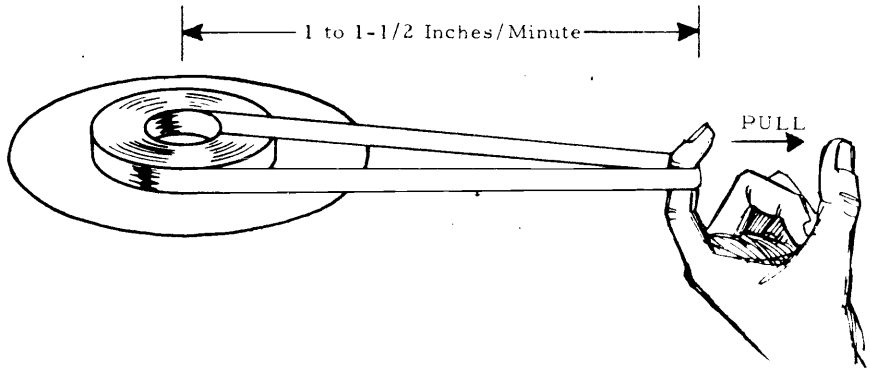
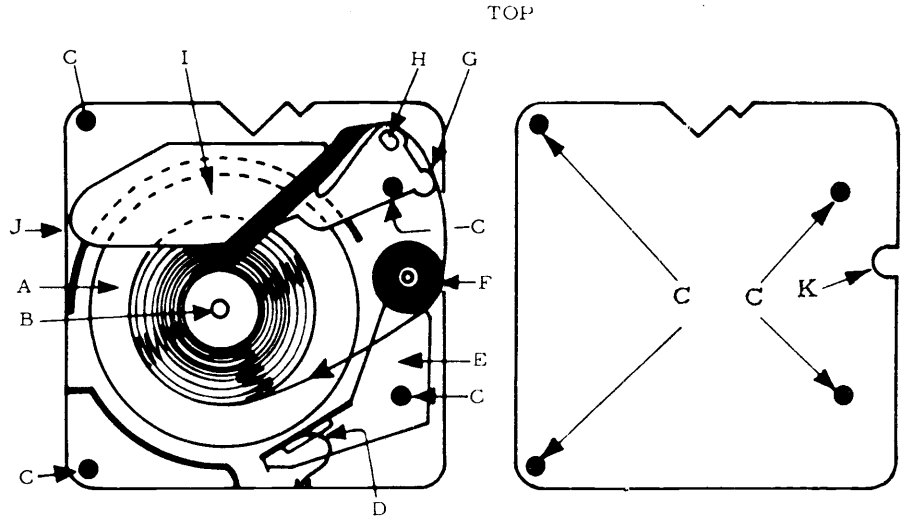


Illustration 11. Checking Tape Tension.

Synchronizing Tape and Film

Film-gate must be in open position before inserting cartridge in the Audiscan Projector. (See Illustration 14.) Insert the loaded Audiscan Cartridge into the Audiscan Projector and turn the machine on. Synchronization may easily be accomplished by either rapidly



Illustrations 12 and 13. Loading the Tape.

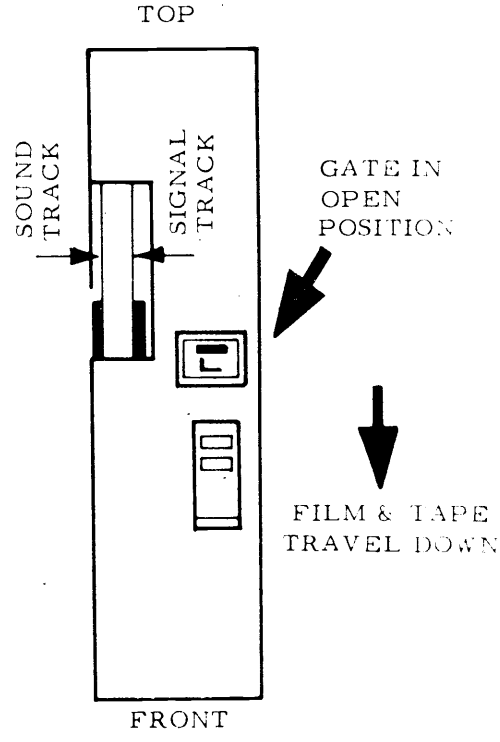


Illustration 14. Synchronizing Tape and Film.

pushing the picture-advance-button on the rear control panel to have the picture catch up with the sound, or depressing the hold-button until the sound catches up with the picture.

Loading Tape and Film in Synchronization

Tape Side. Splice the audio tape between five and six inches behind the shut-off signal with the first advance signal four to five inches in front of the tape splice. If the tape splice lies across the tape guide, then the tape is loaded at the start of the program.

Film Side. Load the end frame of the program in the gate aperture position. This will usually be the first or second black frame and the film side will then be in synchronization with the tape.

APPENDIX D

Related Bibliography by Subject

(AUDIOVISUAL COMMUNICATIONS)

AUDIOVISUAL MATERIALS IN INSTRUCTION

A-V Instruction: Materials and Methods. Second edition. James W. Brown, Richard B. Lewis, and Fred F. Harcleroad. McGraw-Hill Book Co., New York, 1964.

Audio-Visual Communication. United Business Publication, Inc. 200 Madison Ave., New York. (annual periodical)

Audiovisual Instruction. Department of Audio-Visual Instruction. National Education Association, Washington, D. C. (monthly periodical)

AudioVisual Communication Review. Department of Audio-Visual Instruction, National Education Association, Washington, D. C. (Quarterly periodical)

"Automation and Education I: General Aspects." James D. Finn. AudioVisual Communication Review, vol. 5, no. 1, Winter 1957, pp. 343-360.

"Automation and Education II: Automating the Classroom--Background of the Effort." James D. Finn. AudioVisual Communication Review, vol. 5, no. 2, Spring 1957, pp. 451-467.

"Automation and Education III: Technology and the Instructional Process." James D. Finn. AudioVisual Communication Review, vol. 8, no. 1, Winter 1960, pp. 5-26.

Educational Implications of Technological Change. Appendix Volume IV in Technology and the American Economy. National Commission of Documents, Washington, D. C., February 1966.

"From Research to Mock-up in Three Years: Rensselaer's Experimental Classroom." AudioVisual Instruction, April 1963, pp. 206-207.

Instructional Media and Creativity. C. W. Taylor and Frank E. Williams, editors. John Wiley and Sons, New York, 1966.

Media and Educational Innovation. Wesley C. Meierhenry, editor. University of Nebraska Press, Lincoln, 1966.

"Multimedia Instructional Laboratory." Gerlald F. McVey. Audiovisual Instruction, February 1966, pp. 80-85.

"Multiscreen Presentations: Promise for Instructional Improvement." Alvin B. Roberts and Don L. Crawford. Audiovisual Instruction, October 1966, pp. 528-530.

"The Schools, Industry, and New Knowledge." Ronald L. Hunt. Audiovisual Instruction, March 1964, pp. 162-165.

Studies in the Growth of Instructional Technology: Audio-Visual Instrumentation for Instruction in the Public Schools, 1930-1960: A Basis for Take-off. James D. Finn, Donald G. Perrin, and Lee E. Campion. National Education Association, Washington, D. C., 1962.

Technology in Education: Hearings Before the Subcommittee on Economic Progress of the Joint Economic Committee, Congress of the United States, June 1966. Superintendent of Documents, Washington, D. C., 1966.

Technology in Learning. Ontario Curriculum Institute, 344 Bloor Street West, Toronto, Canada, May 1965.

Training in Business and Industry. Gellert-Wolfman Publishing Co., 33 W. 60th Street, New York. (monthly periodical)

Visual Communications Instructor. Syndicate Magazines, Inc. 25 W. 45th Street, New York. (monthly periodical)

THE INSTRUCTIONAL SYSTEM

The Design of Instructional Systems, Robert G. Smith, Jr. Human Resources Research Office, The George Washington University, Alexandria, Virginia, November 1966.

"Educational Escalation through Systems Design." Alexander Schure. Technology--Education, Syracuse University Press, Syracuse, 1966, pp. 55-80.

"Essentials of a Training System." David H. Curl. Training in Business and Industry, March 1967, pp. 37-41.

Instructional Media: A Procedure for the Design of Multi-media Instruction. Leslie J. Briggs and others. American Institute for Research, 135 North Bellefield Avenue, Pittsburgh, Pennsylvania, 1967.

"An Instructional Systems Approach to Course Development." Michael R. Eraut. AudioVisual Communication Review, vol. 15, no. 1, Spring 1967, pp. 92-101.

An Integrated Approach to Learning, with Emphasis on Independent Study. S. N. Postlethwait, J. Novak, and H. Murray. Burgess Publishing Co., Minneapolis, 1964.

"A Point of Transition." Wesley C. Meierhenry. Trends in Programmed Instruction. National Education Association, Washington, D. C. 1966, pp. 272-277.

A Procedural and Cost Analysis Study of Media in Instructional Systems Development: Part A. John Barson. Michigan State University, East Lansing, September 1965 (for the U. S. Office of Education, Grant No. OE-3-16-030).

A Procedural and Cost Analysis Study of Media in Instructional Systems Development: Part B--Instructional Cost Analysis. Gardner M. Jones. Michigan State University, East Lansing, September 1965 (for the U. S. Office of Education, Grant No. OE-3-16-030).

Proceedings of the Engineering Systems for Education and Training Conference, June 14-15, 1966. National Security Industrial Association, Washington, D. C., 1966.

"Programmed Instruction as a Systems Approach to Education." Robert E. Corrigan. Trends in Programmed Instruction. National Education Association, Washington, D. C., 1966, pp. 36-45.

"Psychological Bases for Instructional Design." Robert Glaser. AV Communication Review, vol. 14, no. 4, Winter 1966, pp. 433-449.

Psychological Principles in System Development. Robert M. Gagne, editor. Holt, Rinehart and Winston, New York, 1962.

Studies in the Systems Engineering of Education I: The Evolution of Systems Thinking in Education. Leonard C. Silvern. Instructional Technology and Media Project, School of Education, University of Southern California, Los Angeles, 1965.

"Systems Approach Gets Results." William R. Tracey, Training in Business and Industry, June 1967, pp. 17-21, 32-38.

"A Systems Approach to Botany." S. N. Postlethwait. Audiovisual Instruction, April 1963, pp. 246-252.

The Systems Engineering of Education II: Applications of Systems Thinking to Instruction. Robert Heinich. Instructional Technology and Media Project, School of Education, University of Southern California, Los Angeles, 1965.

"Toward a Behavioral Science Base for Instructional Design." Robert Glaser. Teaching Machines and Programed Learning II: Data and Directions. National Education Association, Washington, D. C., 1965, pp. 771-809.

PERCEPTION, COMMUNICATIONS, AND LEARNING THEORY

The Conditions of Learning. Robert M. Gagne. Holt, Rinehart and Winston, New York, 1965.

Cybernetic Principles of Learning and Educational Design. Karl U. Smith and Margaret F. Smith. Holt, Rinehart and Winston, New York, 1966.

"Instruction and the Conditions of Learning." David K. Berlo. Technology-Education. Syracuse University Press, Syracuse, 1966, pp. 7-20.

Learning about Learning. Jerome Bruner, editor. U. S. Office of Education Monograph 15-OE12019. Superintendent of Documents, Washington, D. C., 1966. (catalog no. FS5.212:12019)

"Learning and Education." B. R. Bugelski. The Psychology of Learning. Henry Holt and Co., New York, 1956, pp. 449-479.

Learning Theory and AV Utilization. Wesley Meierhenry, editor. AV Communication Review, vol. 9, no. 5, September-October 1951.

The Mathematical Theory of Communication. C. E. Shannon and W. Weaver. The University of Illinois Press, Urbana, 1949.

"New Dimensions in Curriculum Development." Ralph W. Tyler. Phi Delta Kappan, September 1966, pp. 25-28.

Perception Theory and AV Education. Kenneth Norberg, editor. Audio Visual Communication Review, vol. 10, no. 5, September-October 1962.

"Principles of Learning." Edgar Dale. The News Letter, vol. 29, no. 4, January 1964. Bureau of Educational Research and Service, Ohio State University, Columbus.

The Process of Education. Jerome Bruner. Harvard University Press, Cambridge, Mass., 1960.

"Psychological Concepts and Audio-Visual Instruction." C. R. Carpenter. AudioVisual Communication Review, vol. 5, no. 1, Winter 1957, pp. 361-369.

Research, Principles, and Practices in Visual Communication. John Ball and Francis C. Byrnes. National Education Association, Washington, D. C., 1960.

Theories of Learning. Third edition. Ernest R. Hilgard and Gordon H. Bower. Appleton-Century-Crofts, New York, 1966.

A Theory of Instruction. Jerome Bruner. Harvard University Press, Cambridge, Mass., 1966.

Understanding Media: The Extension of Man. Marshall McLuhan. McGraw-Hill Book Co., New York, 1964.

"What Do We Know About Learning?" Goodwin Watson. NEA Journal, March 1963, pp. 20-22.

RESEARCH IN DESIGN OF AUDIOVISUAL MATERIALS

"Controlled Variations of Specific Factors in Design and Use of Instructional Media." A. A. Lunsdaine. Instruments and Media of Instruction of Handbook of Research on Teaching. N. L. Gage, editor. Rand McNally and Co., Chicago, 1963.

Enhancements and Simplifications of Motivational and Stimulus Variables in Audiovisual Instructional Materials. Mark A. May. U. S. Office of Education Contract No. OE-5-16-006, July 10, 1965. (a working paper)

Instructional Film Research 1918-1950. Charles F. Hoban, Jr., and Edward B. van Ormer. Technical Report No. SCD 269-7-19. Special Devices Center, U. S. Navy, Port Washington, New York, 1950.

Learning from Films. Mark A. May and A. A. Lumsdaine. Yale University Press, New Haven, Conn., 1958.

"Learning from Visuals: Some Behavioral Considerations." George L. Gropper. AudioVisual Communication Review, vol. 14, no. 1, Spring 1966, pp. 37-70.

Research and Theory Related to Audiovisual Information Transmission. Robert M. W. Travers. Campus Bookstore, Western Michigan University, Kalamazoo, 1967.

A Review of the Literature Pertinent to the Design and Use of Effective Graphic Training Aids. Ezra V. Saul and others. Technical Report SPECDEVCEN 494-08-1, U.S. Naval Training Devices Center, Port Washington, New York, 1954.

The Role of Student Response in Learning from the New Educational Media. Mark A. May. U.S. Office of Education Contract No. OE-5-16-006, August 1966.

"Single and Multiple Channel Communication: A Review of Research and a Proposed Model." Frank R. Hartman. AudioVisual Communications Review, vol. 9, no. 6, November-December 1961, pp. 235-262.

APPENDIX E

Related Bibliography by Subject

(PLANNING AUDIOVISUAL MATERIALS)

OBJECTIVES

"The Analysis of Instructional Objectives for the Design of Instruction." Robert M. Gagne. Teaching Machines and Programmed Learning II, National Education Association, Washington, D. C., 1965, pp. 21-65.

Controlling the Quality of Training. Robert G. Smith, Jr. Human Resources Research Office, The George Washington University, Alexandria, Virginia, June 1965.

Developing Vocational Instruction. Robert F. Mager and Kenneth M. Beach, Jr. Fearon Publishers, Palo Alto, California, 1967.

The Development of Training Objectives, Robert G. Smith, Jr. Human Resources Research Office, The George Washington University, Alexandria, Virginia, June 1964.

The Derivation, Analysis, and Classification of Instructional Objectives. Harry L. Ammerman and others. Human Resources Research Office, The George Washington University, Alexandria, Virginia, May 1966.

Preparing Instructional Objectives. Robert F. Mager. Feron Publishers, San Francisco, 1961.

Taxonomy of Educational Objectives, Handbook I: Cognitive Domain, Benjamin S. Bloom, editor. David McKay Company, Inc., New York, 1956.

Taxonomy of Educational Objectives, Handbook II: Affective Domain. David R. Krathwohl and others. David McKay Company, Inc., New York, 1964.

STORYBOARDS AND SCRIPTING

Audiovisual Planning Equipment. Eastman Kodak Company, publication S-11, November 1966. (free)

Planning a Photo Essay. Eastman Kodak Company, publication AT-39, September 1966. (free)

Planning and Producing Visual Aids. Eastman Kodak Company, publication S-13, April 1966. (free)

SELECTING MEDIA

The Conditions of Learning. Robert M. Gagne. Holt, Rinehart, and Winston, New York, 1965.

Instructional Media: A Procedure for the Design of Multi-media Instruction. Leslie J. Briggs and others. American Institutes for Research, 135 Bellefield Avenue, Pittsburgh, Pennsylvania, 1967.

"Media Stimulus and Types of Learning." William H. Allen. Audiovisual Instruction, January 1967, pp. 27-31.

"Multiple Images," Educational Screen and Audiovisual Guide, February 1963, pp. 84-85, 88.

"Selecting an Instructional Medium." Vernon S. Gerlach. Media Competencies for Teachers. Wesley Meierhenry, editor. University of Nebraska Press, Lincoln, 1966, pp. 70-100.

"Two Screens--What for?" Eastman Kodak Company, Audiovisual Notes from Kodak, publication 63-1, 1962.

Wide-Screen/Multiple-Screen Showmanship. Eastman Kodak Company, publication S-28, April 1966. (free)