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ABSTRACT

Small portable videotape recorders can be used economically and effectively as "scratch pads" during course development. Current off-the-shelf equipment can be used for data gathering during the analysis of systems requirements and initial development of course equipment and test materials. Such equipment has been beneficial in revealing objectives that might otherwise be overlooked, developing a logical presentation without extraneous material, establishing definable objectives, and encouraging self-evaluation as an integral part of the learning process. During the development and validation stages, the equipment can be used for initial scripting, for editing and re-editing, for obtaining content approval, and for individual tryout by students. Finally, the techniques enable the course writers to obtain a viewable end product before they have to commit themselves on the media to be used. The videotapes can then be used as the draft or shooting script for the development of the manual, motion picture, or prenarrated slide sequence. The major criterion is that the equipment be available so that systems designers can use it with a minimum of interruption of their creative endeavors. (Author/JK)

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USE OF PORTABLE VIDEO RECORDERS AS AN INSTRUCTIONAL SYSTEM DEVELOPMENT TOOL

By

Edgar A. Smith

TECHNICAL TRAINING DIVISION
Lowry Air Force Base, Colorado

July 1971

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FOREWORD

This study represents a portion of the in-house research program of Project 1121, Technical Training Development; Task 112101, Advanced Technology for Air Force Technical Training. Dr. Marty R. Rockway was the Project Scientist and Mr. Joseph Y. Yasutake was the Task Scientist.

The material reported summarizes a series of techniques developed over a period of years. The author wishes to recognize particular indebtedness to Dr. Ross L. Morgan and Dr. Theodore E. Cotterman of the Advanced Systems Division (AFHRL/TR), Wright-Patterson Air Force Base, Ohio, and Mr. Milton E. Wood of the Flying Training Division (AFHRL/FT), Williams Air Force Base, Arizona, for their encouragement during the initial stages of the development; and to Mr. Stephen A. Leberer, Curriculum Branch (TTOC), and Mr. Lynn Leaf, Photo Laboratory, Training Aids Branch (TTSTP), Lowry Technical Training Center, Lowry Air Force Base, Colorado, for their consultation and advice. Grateful recognition is also given to both Dr. Marty R. Rockway for his continued guidance and to SSgt Minor P. Johnson for his most appreciated assistance.

This report has been reviewed and is approved.

George K. Patterson, Colonel, USAF
Commander

ABSTRACT

This report proposes that small portable video tape recorders can be employed effectively and economically as a "scratch pad" during course development. Doing so facilitates the Instructional System Development approach. Current off-the-shelf equipment can be used for data gathering during the analysis of system requirements. It can be very advantageous in obtaining clear and concise definition of training requirements. This same equipment can be employed for initial development of the course objectives and the test materials. During this phase it has proven particularly beneficial in revealing enabling objectives that might otherwise be overlooked, developing a logical presentation without extraneous material, establishing definable objectives, and encouraging the inclusion of self-evaluation and confirmation as an integral part of the learning process. During the development and validation stages, the equipment can be used for initial scripting, for editing and re-editing, for obtaining content approval, and for individual tryout by students. During these activities, video enables the development of material through the evolution of many revisions prepared quickly and easily with a minimum of interference with the developmental activity by delays due to requirements for outside technical assistance. Finally, the techniques enable the course writers to obtain a viewable end product before they have to commit themselves on the media to be used. The video tapes can then be used as the draft or shooting script for the development of the manual, motion picture, or prenarrated slide sequence. The major criterion is that equipment be available that can be used by system designers with a minimum of interruption of their creative endeavors. While it is recommended that videocordings be used during the development of training sequences, it is not advocated that they be used for presentations in the classroom. Rather, conversion of the training material to manuals, prenarrated slide sequences, or movies is advocated.

SUMMARY

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Problem

Developing training material is often limited by the need to generate instructional sequences rapidly and without undue concern with photo technology or delays waiting for printed material. Similarly, it is often desirable to generate training material through more tangible revisions and with the coordination of more specialties than is currently practical.

Approach

During a series of in-house and contractual efforts, a number of techniques have been developed that bear promise in expediting the preparation of instructional materials. These techniques are presented here systematically as they might be applied to the Instructional System Development procedures as described in Air Force Manual 50-2.

Conclusions and Recommendations

It is recommended that portable 1/2-inch video recorders be employed to gather data during (*a*) the analysis of the system requirements, (*b*) the definition of training requirements, (*c*) the development of objectives, and (*d*) the development of the instructional package, especially as related to problems of scripting, editing, obtaining content approval, and initial tryout. It is not recommended that the equipment be utilized in later classroom presentations.

This summary was prepared by Edgar A. Smith, Technical Training Division, Air Force Human Resources Laboratory.

TABLE OF CONTENTS

		Page
I.	Introduction	1
II.	Discussion	1
	Data Gathering to Analyze System Requirements	1
	Definition of Training Requirements	3
	Development of Objectives and Tests	3
	Planning, Development, and Validation of Instruction	5
	Conducting and Evaluating Instruction	6
III.	Conclusions and Recommendations	7

FIGURE

Figure		Page
1	Instructional system development model	2

USE OF PORTABLE VIDEO RECORDERS AS AN INSTRUCTIONAL SYSTEM DEVELOPMENT TOOL

I. INTRODUCTION

Recent advances in small portable video recording equipment and techniques afford economical, efficient, and effective methods of implementing many of the Instructional System Development (ISD) procedures. The techniques can be of value in such activities as recording data during field observations, preparing initial training sequences for tryout, and communicating final requirements to graphic and photographic personnel.

This report briefly summarizes experiences in utilizing half-inch portable video systems in the development of experimental training sequences. Part of the material presented here is based on in-house efforts of the Technical Training Division, the rest on projects for which Division personnel were observers, consultants, or contract monitors. Association with such projects as the Military Assistance Program Learning Center at the 3389th Pilot Training Squadron, Keesler Air Force Base, and the Automated Apprenticeship for Security Policeman contract conducted by Applied Science Associates, Valencia, Pennsylvania, has provided confirmation and augmentation of the in-house experiences.

The material in this report is organized and developed to indicate the Instructional System Development applications of videocorders as they appear today. It is assumed that the reader is familiar with AF Manual 50-2, *Instructional System Development*. All of the examples described in this report refer to existing training programs for existing hardware systems. The general approach, however, would be equally suitable for use during the development of a new hardware system.

II. DISCUSSION

The Instructional System Development model presented in Figure 1 serves as a convenient guide for discussion of the applications of portable video recorders in the development of training sequences.

Data Gathering to Analyze System Requirements

In developing training sequences, particular care is required during the initial step "Analyze System Requirements." With or without video, this phase requires careful reading of documentation relevant to the system requirements for the equipment involved, regulatory and procedural publications describing the career areas and specialties, and other information on the training organization.

This reading is not an unmixed blessing. While it does provide background that is necessary, it is a paperwork background. At times the paperwork takes on undue importance and obscures as much as it reveals. Essential as it is, the written descriptions sometimes provide only a blurred reflection of the actual situation. Considerable care must be taken to assure that it is the system requirements that are being analyzed and not merely someone's written description of how he visualized it many years ago. The ultimate criterion is job performance. "Instructional systems are effective only to the extent to which they qualify personnel for successful job performance" (AFM 50-2, Section 2-4).

One very effective method of assuring that a realistic orientation is obtained is to make use of observations of local classrooms and duty areas and field trips to operational bases. Particularly on field trips portable video recording can play a very useful role because such trips provide only a very limited and brief encounter. So many things are happening that it is difficult to isolate the most essential and concentrate attention upon them. At times this difficulty is unintentionally magnified by a host who is not quite sure that an observer is gathering data and not conducting an inspection of some sort. As a result, the observer often is shown tidy rooms in which prescribed duties are being performed by the manual rather than the way they are normally done. Even under the best of conditions, the observations cannot be as detailed, as prolonged, nor as clear as may be desired. This is particularly true during initial contacts when it is the overall system requirements that are of interest rather than precise step-by-step operating procedures.

A specific illustration might clarify some of the essentials. The case cited is a caricature of several situations and not a true description of any one. However, it does summarize real situations which have occurred.

The illustrative situation involves the training of Vietnamese personnel. In the analysis of system

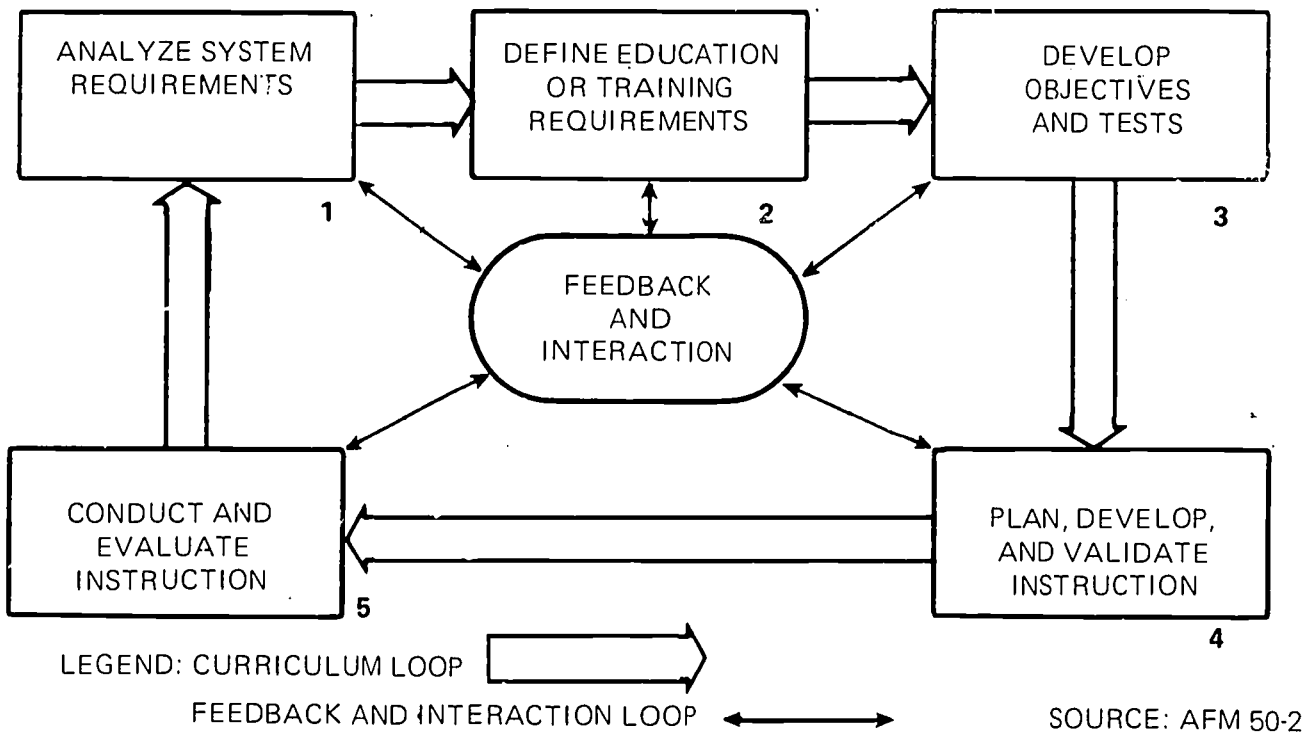

Fig. 1. **Instructional system development model. (From ATCR 52-33, 25 May 71)**

requirements, it is essential to pay attention both to the system and to the personnel. The typical Air Force course assumes a background in the English language and the American culture. It also assumes definite "mechanical orientation" and "affinity for team work." These considerations are so basic that they are rarely raised in relation to most training programs. However, when considering the training of personnel from other cultures, they cannot be taken for granted. The illustrative example relates to a course in munitions handling for Vietnamese students. The television equipment was made available to the course workers involved, and some minimal technical support was afforded them. The technical support was kept to a minimum to avoid excessive classroom disruption. Obviously, it is not practical to place a camera directly in front of a student, surround him with a large group of strangers doing strange things with strange gear, shine blinding lights in his eyes, and then expect him to behave in a purely natural way.

The instructional area consisted of a classroom with an attached laboratory area. Before class started, the recorder and a single camera on a small tripod were readied in the laboratory near the connecting door. When the students entered the classroom initially, they naturally exhibited a curiosity about the equipment. Initially, they stood in a row staring. As they saw themselves on the monitor, the strangeness dissolved. A very candid atmosphere developed. The instructor explained the purpose of the equipment and requested the students' cooperation. By aiming the camera through the open door and putting the microphone on the instructor's desk, a usable recording of a 15-minute classroom segment was obtained. The segment included the instructor's presentation, questions from the students, and some discussion. This was followed by a laboratory demonstration which was also taped. Then, during an informal break, the recording continued, but in the most inconspicious way. The two writers, the instructor, and the technician stood near the TV equipment talking while the students clustered near a training device across the room. The TV monitor was turned off to eliminate the distraction, but the recording continued. In this way, some 20 minutes of understandable dialogue and action were recorded.

Total time involved was about two hours for the visiting personnel and about an hour of classroom time. Although the hour was probably unproductive from a classroom point of view, it was undoubtedly rewarding in other ways.

Having the video tape to analyze at their office was of considerable benefit to the course writers. Examination of the recording indicated that the sequences became progressively more candid and probably more realistic. The initial classroom sequences indicated the seating arrangement and demonstrated the students' fluency in English.

While the atmosphere was probably as natural as that observed during most classroom visits, it was still quite artificial. By the time of the break, both the equipment and the observers were taken for granted. Through analysis of this portion of the recording, the students could be observed about as naturally as is ever possible. By viewing the recording repeatedly, it was possible to observe their behavior and listen to their informal speech. They spoke English almost exclusively, even during the free time. They disassembled and assembled the weapon they had studied the day before, these activities requiring considerable mechanical dexterity. They performed exceedingly well as a team, although there was little or no evidence of a team leader. They asked questions; they helped each other; they kept very busy and appeared to be most content. From these observations the two course writers were able to prepare their material with more assurance and much more detailed preparation, in effect, going into the project as experienced personnel. It should be recalled that they were investigating the training of foreign nationals.

This illustration portrays a number of the distinguishing characteristics of the analysis of system requirements. During this stage the groundwork is being laid for the subsequent efforts. As a result, the program must be viewed in its broadest perspective to "get the big picture." Who is going to be trained? What does he know when he comes to training? What must he know when he leaves? How does this relate to other Air Force activities?

The illustration also suggests that the five steps of Instructional System Development are not always five discretely different steps. They are aspects of a total system and can often be put in a temporal order to provide for a schedule. However, they are also like the height, width, length, color, and weight of a table. All coexist. Each step is basically a restatement of the others. They are all leading to the same goal—personnel performing jobs efficiently and effectively.

Definition of Training Requirements

Defining training objectives is directed at translating the system requirements into more clearly specified training specifications. What are the duties that must be performed? Under what conditions must they be performed?

The reference to "duties" requires emphasis. Notice that this refers to actions or tasks. Here again, portable video recorders are useful. There are manuals that describe the duties of a security policeman. For example, one of his duties is "guard mount." Recording a guard mount and studying it in detail gives meaning to the words "guard mount." In the first place, "guard mount" is not an object but a series of actions. The ISD system designer would probably add a word to specify "stand guard mount" rather than "guard mount." In the development of the automated apprenticeship program, considerable use was made of portable video recordings to clarify such tasks. What precisely do they do during a guard mount? Among the other things, they cover the special orders of the day, and they make assignments. What does the gate sentry do? To state that he "controls entry into his assigned area" does not convey much information. Viewing recordings of the gate sentry at Lackland, Brooks, Cannon, Kirtland, Lowry, Webb, and Goodfellow Air Force Bases gives a better understanding of the diversity of their tasks. It also reveals that there are some places where the camera is not welcome. Viewing a series of recordings in rapid succession can be beneficial. It is very revealing to notice the number of things that were overlooked previously. When reviewing the recordings, the system designer is probably looking for different things or is viewing them from a different point of view. Also, he may have noticed a number of things during the initial observation, with the intention of noting them, but perhaps he neglected to do so. Unfortunately, many of these are neglected because they are so obvious. To illustrate how easy it is to overlook the obvious, consider this question. The face on a wall clock normally has 12 numbers on it. How many numbers are there on the face of your wristwatch? No tricks involved. It is surprising how many people will have to look to see how many numbers there are on their watches!

The primary advantage of recording data during the definition of training requirements is to enable the system designer to obtain a fuller understanding of what the requirements entail. What is meant by "issue warning," "interrrogate suspect," "enforce speed limits," "issue permit," or "lower flag"?

Development of Objectives and Tests

The previous discussion has been largely about the duties that are to be performed. Translation of these statements of requirements into descriptions of actual behavior is encompassed in the third ISD step, "Develop Objectives and Tests." A pilot conducting a preflight of a T-41 trainer must

"check flaps." This requirement must be translated into what he must know and do to meet that requirement. If the instructor pilot records a preflight as he would make it, he then has the basic data from which to develop the training objectives and tests.

There is a very simple procedure that has proven useful in a number of situations. Get two instructors familiar with the use of either a handheld or a tripod-mounted camera with associated zoom lens, recorder, and monitor. Let them use it informally until they are comfortable with it. The tape can be erased and re-used many times. For simplicity, assume that the task to be taught is the operation of a 35mm slide projector. Let one of the instructors serve as the "cameraman" and the other as the "instructor." Let the cameraman film the instructor as he prepares the projector for use. This lets them make certain that they have everything they need so that they do not have to interrupt their activities because they forgot to bring a slide tray. After they have practiced until they can easily perform their tasks without obvious strain, bring in a naive subject. The subject should be someone who literally does not know how to perform the task—perhaps a new student or someone who is in no way associated with the task. Now if the "instructor" gives directions to the "student" while the "cameraman" films the activity, a surprisingly usable series of steps are made evident. It is essential that the student be naive. If he is an expert he will either habitually do many acts without pointing them out, or he will play devil's advocate and bring out a lot of extraneous possibilities that are not required at this time. It is this obtaining of a complete yet minimal series of steps that the procedure tends to provide. The "instructor" will probably start with, "First you put the tray on." The "student" will probably ask, "Put what tray where?", revealing that first he must take the projector out of its case, plug it into the wall, and so on.

The procedure is a simple one and naturally has some limitations. However, it does have advantages. It often leads to a more natural series of operations or procedural steps than an armchair analysis by an expert. Sometimes an outline can be provided on a chalkboard or a story board visable to the instructor, giving the general outline as developed during the initial preparations. The outline also might have some suggestions as to camera angle and distance. As a rule, these would be just rough notes to provide general guidance rather than a full-scale shooting script.

To summarize, the general procedure is to have an experienced person direct a naive person through the activity while a fellow instructor records it on video tape. It is a simple technique that requires little time, money, or special talent. If video is not available, the same technique can be used with a polaroid camera although that usually involves a serious number of distractions. Substituting a 35mm slide camera is more suitable. While this latter technique requires some delay in viewing, it does provide good images if the cameraman is skilled and if a good set of strobes are available. In general, the procedure here becomes one of making a slide each time the student is directed to do something. If the naive subject must be told now, the real student will probably have to be shown in the final version. This technique omits the audio portion of video recording and lacks both the immediate replay and the motion capability of video. However, if video recorders are not available, it is a worthwhile procedure to use especially if the final product is to be a prenarrated slide presentation.

The procedure outlined here was initially developed as a method of specifying the objectives of an instructional segment. It has several additional benefits.

1. *Enabling Objectives.* Many enabling objectives are revealed that might otherwise be overlooked. Telling the student that an output voltage should be within 2 percent of the listed value should reveal that he must be able to compute percentages. It also suggests that he should be able to approximate them without resorting to the use of pencil and paper. Instructing the student to process film for 4 minutes at 68 degrees assumes that he can use a timer and thermometer.

2. *One Logical Presentation.* The technique encourages the system designer to develop one logical presentation with a minimum of instructional detours. When the task is to obtain a given reading via a Techtronic Oscilloscope and the procedures of a person manipulating the scope are being recorded, there is a tendency to eliminate extraneous material. If a piece of information might possibly be used sometime, it is probably wise to omit it from introductory lessons. If the step is important and occurs frequently, it should be included. If the activity is a safety precaution, it should be included precisely at the point where it is most applicable. As a rule, stick to the point. Listening to oneself ramble soon becomes annoying. The student is involved in learning a

specific task. Help him. Do not try to impress him with an interpretation of ancient history.

3. *Definable Terminal Objectives*. Employing the camera to photograph the instruction clearly calls for an object or an activity to be photographed. It is difficult to point the camera at an "appreciation for" or an "understanding of." It is easier to photograph a student "pouring" or "mixing" or "assembling" or "constructing." This sort of specification promotes the clear definition of terminal objectives.

4 *Self-Evaluation and Confirmation*. This procedure also requires completing the activity at some terminal point. If behavior is being recorded on video, at some point the recorder must be stopped. The recorder was started when the student started the activity. It is equally important to instruct the student in finishing. This will often take the form of "Before putting the soldering gun down, make certain that . . . ." This automatically builds in a self-evaluation and feedback situation.

It is certainly not implied that the simple utilization of video tape automatically provides for all of the confirmation and evaluation needed. But its use does tend to incorporate both confirmation and evaluation throughout the learning process. It certainly promotes objectively definable terminal objectives.

In summary, using video recording tends to (*a*) reveal implicit enabling objectives that might be overlooked, (*b*) allow development of a logical presentation without extraneous material, (*c*) promote definable objectives, and (*d*) encourage self-evaluation and confirmation as an intregal part of the learning process.

The Learning Objective Worksheets would probably be completed at this point. Having the tape to review during this process should simplify the procedure.

Planning, Development, and Validation of Instruction

The procedures developed during the discussion of the development of objectives leads directly to the development of a valid instructional package. The video equipment can be utilized very effectively during this phase of ISD. The applications of video here fall into four areas.

1. *Scripting*. The video tape developed by the two instructors and the naive subject in the previous step can serve very precisely for the development of a script. In many cases, it could serve as a script. The difference is primarily one of orientation. The initial tape is usually employed as rough notes from which a script is developed. The script copy should be complete enough to portray the entire instructional sequence and should be directed at the learner. This will include both the audio and the visuals. The visuals will probably contain material similar to that used in developing the objectives. It may also contain a good deal of graphic material and sub-titles. (Sub-title refers to showing written words on the monitor.) These do not have to be elaborate or in final form. Writing on a piece of typing paper with a felt tipped pen is sufficient. These can be held up in front of the camera. Illustrations from manuals can be handled the same way. If necessary, use a macro lens so that you can focus on small areas.

By analogy, the videocorder is being used as a "mediated typewriter." In the data gathering discussed previously, a videocorder was used to gather data which corresponds roughly to written notes. In developing the script, the videocorder is being used to generate what might be called the "typed copy" of the training material. It can be viewed, yet is specifically developed for revision. Just as a publication progresses through longhand notes, to typed copy, to revised typed copy, to final typed or locally offset copies, to final printed version, the mediated material can be processed through a number of video recordings before being finalized. The video recordings are the rough notes, the typed copy, and the initial trial copy that precede the final copy. The present methods of generating visuals are roughly parallel to attempting to give dictation straight to a linotype operator.

2. *Editing*. Editing refers largely to viewing the script and revising it. Then that script is viewed, discussed with some peers, and revised again. And again. And again. The major advantage of video tape at this juncture is that it can be revised easily and quickly. It enables the system designer to view his own work in a remarkably detached way. When he sits back and watches his own presentation on a monitor, he can give himself constructive criticism and can accept it from others with a minimum of ego involvement. However, one warning is in order. Most persons are made embarrassingly aware of technical flaws in their material when it is recorded for viewing. It is highly possible that the same errors have been made on the platform for years, but they may not have been noticed if there has been no opportunity for careful observation.

When the material is recorded, it is put on display for criticism. This criticism is often overdone. Everyone and his brother becomes an expert. Most of them seem to believe that the only way they can display their expertise is to give negative comments. If they are skilled, they can get in comments that sound devastating yet are meaningless as far as providing clues for improvement. For example, if a comment includes both that there should be much more detail and also that the presentation is much too lengthy, the course writer might be well-advised to nod knowingly and count to ten.

3. *Content Approval.* This is the final outgrowth of editing. It may be more of an administrative action than editing in that the course supervisors view the effort and indicate whether or not they feel that it meets the requirements. Without video, this step is not done until the project is completed, at which point it is difficult or impossible to make changes. One of the major advantages of video tape is that it can be revised rapidly. The course writer can let the responsible people view the segment as soon as he is willing to commit himself. Corrections can be made at this point very easily. Often an outsider will see important things that may have been missed by the writer. That is one of the reasons for review. By the same token, after they have committed themselves to accepting the content, there is more assurance of ultimate acceptance of the final product.

4. *Individual Tryout.* Many times the presentation at this point is polished enough for use by students. If so, careful observation of individual students will initiate the validation procedures while it is still easy to make modifications. These initial observations will usually forecast quite accurately the final acceptance and suitability of the material. The careful observation of individual students and the personal conversations that normally evolve are often as revealing and usable as later statistical analysis of large-scale validation groups.

It will be noted that to this point little mention has been made of the media to be used. There has not been a need for a decision until this point. Here the material can be viewed with the proper personnel, and the decision can be made whether the content should be put in a manual, a series of slides, a prenarrated slide series, a motion picture, or some other form. With video most of the possibilities are there–visuals, motion, and audio. Although color may not be available, it is now possible to ascertain whether or not color is essential. It is recommended that the video presentation be viewed to facilitate the selection of the final media. The viewing situation contains much of the information required to make the selection intelligently. At this point, the content has been stabilized, the student population is known, and the instructional environment is known. The most appropriate media to fit those needs can be selected.

As an example, assume that it is decided to present the material via a prenarrated slide presentation. The audio of the video tape can be transcribed by a secretary. Usually this requires only minor revisions for conversion to a narrator's script. The graphics personnel can usually view the video and obtain the information they need. The usual result is the use of more color slides showing people and things and less graphics of words and tables. This often saves considerable art work. It is at times difficult for the graphics people to develop a suitable style, but that is true any time 35mm is substituted for overhead visuals. While not eliminating the problem, the video tape makes the transition somewhat easier. Normally, the use of video tape can reduce the final preparation of the training sequence to a matter of hours rather than a matter of weeks.

The reduction in preparation time is particularly important when many different specialties are involved in the project. Facilitating communication between specialties is probably the "secret ingredient" of the entire process. The playback of the audio and the visuals eliminates much of the communications barrier between specialists. The instructors do not have to learn "ASA" and "establishment view," and the cameraman is shown a "confirmation frame."

Conducting and Evaluating Instruction

The terminal step in the ISD process is to put the instructional material in the training situation and determine whether or not it actually accomplishes what it was designed to do.

In the main, it is *not* recommended that video recordings be used for this purpose. While videocorders are most valuable during the developmental stages, it is recommended that the material be converted to a manual, a prenarrated slide series, or a movie before routine classroom use begins. The equipment would have some classroom use in providing self-confrontation techniques or in presenting material that is so current that it is

not available in other forms. But the technique advocated here is to utilize the small portable video systems in the development of instructional material and then to convert it into more conventional media for classroom presentation.

III. CONCLUSIONS AND RECOMMENDATIONS

This report proposes that small portable video tape recorders can be employed effectively and economically as a "scratch pad" during course development. Doing so facilitates the ISD approach. Current off-the-shelf equipment can be used for data gathering during the analysis of system requirments. It can be very advantageous in obtaining clear and concise definition of training requirements. This same equipment can be employed for initial development of the course objectives and the test materials. During this phase it has proven particularly beneficial in revealing enabling objectives that might otherwise be overlooked, developing a logical presentation without extraneous materials, establishing definable objectives, and encouraging the inclusion of self-evaluation and confirmation as an integral part of the learning process. During the development and validation stages, the equipment can be used for initial scripting, for editing and re-editing, for obtaining content approval, and for individual tryout by students. During these activities, video enables the development of material through the evolution of many revisions prepared quickly and easily with a minimum of interference with the developmental activity by delay due to requirements for outside technical assistance. Finally, the techniques enable the course writers to obtain a viewable end product before they have to commit themselves on the media to be used. This tape can then be used as the draft or shooting script for the development of the manual, motion picture, or prenarrated slide sequence. The major criterion is that equipment be available that can be used by system designers with a minimum of interruption of their creative endeavors. While it is recommended that videocordings be used during the development of training sequences, it is not advocated that they be used for presentations in the classroom. Rather, conversion of the training material to manuals, prenarrated slide sequences, or movies is advocated.

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13. ABSTRACT

This report proposes that small portable video tape recorders can be employed effectively and economically as a "scratch pad" during course development. Doing so facilitates the Instructional System Development approach. Current off-the-shelf equipment can be used for data gathering during the analysis of system requirements. It can be very advantageous in obtaining clear and concise definition of training requirements. This same equipment can be employed for initial development of the course objectives and the test materials. During this phase it has proven particularly beneficial in revealing enabling objectives that might otherwise be overlooked, developing a logical presentation without extraneous material, establishing definable objectives, and encouraging the inclusion of self-evaluation and confirmation as an integral part of the learning process. During the development and validation stages, the equipment can be used for initial scripting, for editing and re-editing, for obtaining content approval, and for individual tryout by students. During these activities, video enables the development of material through the evolution of many revisions prepared quickly and easily with a minimum of interference with the developmental activity by delays due to requirements for outside technical assistance. Finally, the techniques enable the course writers to obtain a viewable end product before they have to commit themselves on the media to be used. The video tapes can then be used as the draft or shooting script for the development of the manual, motion picture, or prenarrated slide sequence. The major criterion is that equipment be available that can be used by system designers with a minimum of interruption of their creative endeavors. While it is recommended that videocordings be used during the development of training sequences, it is not advocated that they be used for presentations in the classroom. Rather, conversion of the training material to manuals, prenarrated slide sequences, or movies is advocated.

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