R E P O R T R E S U M E S

ED 014 222 EM 000 520

A REPORT ON TELEVISION IN ARMY TRAINING--THE APPLICATION OF TELEVISION AND KINESCOPE RECORDINGS TO REDUCE INSTRUCTOR AND STUDENT TRAINING TIME AND TRAINING COSTS.

BY- KANNER, JOSEPH H. AND OTHERS
OFFICE OF THE CHIEF SIGNAL OFFICER, DEPT. OF ARMY

PUB DATE 1 JUN 58

EDRS PRICE MF-$0.25 HC-$1.80 43P.

DESCRIPTORS- *INSTRUCTIONAL TELEVISION, *ELECTRONICS, *APTITUDE, *ACADEMIC PERFORMANCE, *TEACHING METHODS, U.S. ARMY SOUTHEASTERN SIGNAL CORPS SCHOOL, FORT GORDON, GEORGIA

FIVE METHODS OF TEACHING INSTALLATION, OPERATION AND MAINTENANCE OF PORTABLE, ELECTRIC-POWER GENERATING EQUIPMENT TO ENLISTED MEN WERE COMPARED. METHODS WERE--38-HOUR CONVENTIONAL INSTRUCTION, 38-HOUR INTENSIVE TV INSTRUCTION, AND 3 16-HOUR TV COURSES, USING EXPERIENCED AND INEXPERIENCED INSTRUCTORS, AND KINESCOPE RECORDINGS. A POST-SELECTION, RANKING PROCEDURE EQUATED 36 TRAINEES ON APTITUDE DIFFERENCES. STATISTICAL ANALYSIS OF SCORES ON IMMEDIATE POST-TESTS AND RETENTION TESTS 1 MONTH LATER SHOWED THAT TRAINEE LEARNING AND RETENTION FOR THE 38-HOUR CONVENTIONAL AND TV INSTRUCTION WERE SUPERIOR TO THAT FOR ANY OF THE 16-HOUR COURSES. AMOUNT OF INSTRUCTOR EXPERIENCE WAS NOT RELATED TO LEARNING IN THE 16-HOUR COURSES. KINESCOPE INSTRUCTION WAS AS EFFECTIVE AS 16 HOURS OF TV INSTRUCTION WITH EXPERIENCED TEACHERS. THERE WAS NO SIGNIFICANT DIFFERENCE IN RETENTION IN ANY OF THE 16 HOUR COURSES. IMMEDIATE SCORES SHOWED HIGH APTITUDE TRAINEES LEARNED AT LEAST AS MUCH IN 16 HOURS AS LOW APTITUDE TRAINEES IN 38 HOURS. NO SIGNIFICANT RELATIONSHIP WAS FOUND BETWEEN NUMBER OF TRAINEES DROPPED AND INSTRUCTIONAL METHOD. COST SAVINGS DUE TO USE OF TV WERE INDICATED. DATA ARE REPORTED IN TABLES SHOWING STATISTICAL SIGNIFICANCE LEVELS BASED ON ANALYSIS OF VARIANCE AND T-TESTS. (LH)

A REPORT ON
TELEVISION IN ARMY TRAINING

THE APPLICATION OF TELEVISION AND KINESCOPE RECORDINGS TO REDUCE INSTRUCTOR AND STUDENT TRAINING TIME AND TRAINING COSTS

by Joseph H. Kanner
William A. Mindak
Sanford Katz

Department of the Army
Office of the Chief Signal Officer

1 June 1958

This report has been prepared under the joint efforts of the Audio-Visual Applications Office, Army Pictorial Service Division, Washington 25, D. C. and the Television Division, Army Pictorial Center, and is published for the information and guidance of all concerned. The report is one of a series of studies conducted at Fort Gordon, Georgia, to demonstrate methods of implementing television techniques in standard classroom instruction and to evaluate their effectiveness for standard classroom instruction.

ACKNOWLEDGEMENTS

Appreciation is expressed to Brigadier General Ralph T. Nelson, Commanding General, U. S. Army Signal Training Center, Fort Gordon, Georgia, for the cooperation and support given to this study. Personnel of the Television Branch and the Test and Evaluation Branch of the U. S. Army Southeastern Signal School at Fort Gordon gave generously of their time and effort in meeting many of the difficult administrative and testing requirements. Support and encouragement were also received from the Combat Development and Operations Division, OCSigO, and particular appreciation is expressed to Brigadier General Kenneth Zitzman, Colonel Charles Burch, Colonel Morton Rubin, and Mr. Harry Siegal. The Chief, Army Pictorial Service Division, OCSigO, Colonel W. W. Lindsay, has for many years encouraged and supported Signal Corps television research. Lt. Colonel Norman Gray and Major Hugh C. Oppenheimer participated in the development of the Signal Corps television research program and gave it the staff support necessary for its fulfillment. Colonel Arthur A. McCrary, Commanding Officer, Army Pictorial Center, played a vital role by his encouragement and support in making available research personnel, equipment and other requirements necessary for the present study.

Research Personnel

This study stems from a program developed by Dr. Joseph H. Kanner, Chief, Audio-Visual Applications Office, Army Pictorial Service Division, OCSigO, and Drs. Richard P. Runyon and Otello Desiderato, formerly with the Applications-Development Branch, Television Division, Army Pictorial Center. The study was conducted by SP-3 William A. Mindak, Ph.D., and the statistical analyses were carried out by SP-3 Sanford Katz, Ph.D., Television Division, Army Pictorial Center. At the Southeastern Signal Corps School, Fort Gordon, Georgia, cooperation and assistance during various critical phases in the conduct of the study were received from Captain Steven Chomos, Mr. Joseph Jordan, Mr. Thomas Chandler, and Mr. Steven Duboski, Testing and Evaluation Branch, TSESS.

Preface

THE SIGNAL CORPS TELEVISION RESEARCH PROGRAM

The present study is one of a series stemming from a joint Signal Corps research program. The program represents a coordinated effort by the Army Pictorial Service Division, the Combat Development and Operations Division, OCSigO, the Army Pictorial Center, and the Signal Schools at Fort Gordon, Georgia, and Fort Monmouth, New Jersey. In August 1955, representatives of these organizations developed a long range program of research, designating critical areas of informational needs (16). Underlying this research program were two basic information targets. The first of these was the potential role and application of television during periods of emergency or mobilization. A previous study (10) had already indicated television's ability to teach a variety of military subject matters at least as well as conventional classroom instruction. This teaching equivalence, combined with television's ability to reach large or scattered groups of trainees, pointed out an important potential military use for television as a training and informational medium both in emergency and routine requirements.

It was also apparent that more information was needed concerning the effective uses of television for every day military training. Of immediate interest were such questions as instructor requirements for television teaching, television cost factors, intensive television instruction and reduction of teaching time.

Two studies were planned whose results would cut across many of the above areas of interest. The first, designed to evaluate the effects of "intensive" television teaching, has been reported (9). The second, described in this report, has the following objectives: (1) to evaluate the use of television for reducing conventional training time; (2) to evaluate techniques for rapidly training television instructors; (3) to explore the economy and effectiveness of using television recordings for more extensive segments of instruction; (4) to explore economies in developing and using television training aids; (5) to develop guidelines for preparing effective television instruction.

When added to the results of previous Signal Corps research, the present study further expands the application of television to military training requirements both in everyday and mobilization or emergency needs. Future Signal Corps research will be directed to the continued development of television for military training. In addition, the application of these results to military training will be encouraged.

REPORT SUMMARY

Background

This study is part of a series conducted at the Southeastern Signal Corps School, Fort Gordon, from January to September 1956. The first phase of this series has been reported (9). The present study was concerned with evaluating and exploring the use of television to achieve the following:

(1) Reduction in training time of an existing 38 hour block of conventional instruction in the Powerman's Course, MOS 351.

(2) Rapid training of new television instructors.

(3) The employment of television recordings (kinescopes) for more extensive segments of training.

(4) Economies in preparation and use of television training aids.

(5) Development of guidelines for preparing effective television presentations.

Procedure

The study was divided into three phases. Phase I was the development and testing of a 16 hour television version of the 38 hour introduction to the Powerman's Course, MOS 351, using experienced classroom instructors. Based on written tests, comparisons were made between trainees receiving this shortened instruction and those receiving the original 38 hours of instruction. This abbreviated instruction was repeated four times to four different groups.

In Phase 2, two inexperienced instructors, without any previous teaching experience or electronics knowledge, were trained to teach the 16 hour television course. Comparisons were made for teaching effectiveness with experienced instructors. This phase was repeated three times to three different groups.

In Phase 3, the 16 hours of television instruction were kinescoped and used to teach groups of trainees. The effectiveness of these kinescopes was compared with the other methods of teaching.

All comparisons were based on six written tests, revised and abbreviated from 10 tests used in the previous study (9) and given immediately after instruction. In addition, a 70 item retention test used in the previous study was again employed about one month after the original instruction.

Results

1. Trainee learning and retention from the 38 hours of conventional or television instruction were superior to that achieved from the 16 hour shortened block of television instruction.

2. There were no significant differences in the number of trainees failing to complete the Power Maintenance Course, whether receiving 38 or 16 hours of instruction.

3. High aptitude trainees learned as well from 16 hours of television instruction as did low aptitude personnel from 38 hours of classroom or television instruction.

4. Rapidly trained but inexperienced instructors were as effective as experienced instructors in teaching 16 hours of television instruction.

5. Trainee learning from 16 hours of kinescope recorded instruction was as effective as from 16 hours of "live" television instruction.

6. There was no difference in trainee retention of learning when the 16 hours were taught over television by experienced or inexperienced instructors, or by kinescope recordings.

7. There were indications of important savings in training aids and teaching costs through the use of television.

Recommendations:

1. Similar efforts be made to reduce instruction time for television presentation in Signal Corps and other Army training courses, using guidelines developed in this study together with a testing program.

2. Critical courses be recorded on film on a more extensive basis for use during routine and emergency training periods.

3. Rapid television training methods be employed for training new instructors.

4. Selection procedures for assigning trainees to courses be adjusted to facilitate training for high and low aptitude personnel.

5. The capability of television for reducing training aid costs should be another criterion in determining its use in military training.

TABLE OF CONTENTS

TABLE OF CONTENTS (cont'd)

Chapter 1

PURPOSE AND DESIGN OF THE STUDY

Introduction

This study is one of a series of U. S. Army Signal Corps studies designed to investigate and develop the use of television for military training. It was carried out at the Southeastern Signal Corps School, Fort Gordon, Georgia, using television facilities, trainees and personnel available at that installation. The general objectives of the study relate to developing television to meet pressing military training problems and to explore the use of television and television recordings for achieving economies in training time and costs.

Prior attempts to use television for achieving reductions in training time required the full time services of professional research personnel. To reduce or eliminate the requirement for such personnel, the attempt was made in the present study to develop guidelines and procedures which could be employed by military personnel using television as a training medium.

Study Objectives

The present study was concerned with evaluating and exploring the use of television to achieve the following:

(1) Reduction in training time of an existing 38 hour block of conventional instruction in the Powerman's Course, MOS 351.

(2) Rapid training of new television instructors.

(3) The economy of employing television recordings (kinescopes) for more extensive segments of training.

(4) Economies in preparation and use of television training aids.

(5) Development of guidelines for preparing effective television presentations.

Subject Matter

A 38-hour block of electricity instruction, given in the first week of the Power Maintenance Course was used. This instruction had been used in a previous study (9).

The purpose of the Powerman's Course is to train selected enlisted personnel to install, operate, and perform organizational maintenance on portable, electric-power generating equipment. Essential to the successful performance of their mission is a thorough grasp of the fundamentals of electricity as related to their jobs.

The material covered in the course includes: First Aid, Electricity and Magnetism, Use of Test Equipment, Ohm's Law, Parallel and Series Circuits, Electromagnetism, Induction, Transformers, Storage Batteries, the RA-91 Rectifier, the Reading of Diagrams, Charging Storage Batteries, and Maintenance Records.

The first week of the course was usually taught through a series of lectures, and consisted of approximately 38 class periods extended over five days. It included a number of training films as well as practical exercises during which time the students were given an opportunity to apply what they had learned during the lectures.

Tests

Ten tests developed in the previous study (9) were modified into six abbreviated tests. The tests were revised by further eliminating items which failed to discriminate or were too easy or difficult. These revisions were also necessary because of the reductions in time available in the present study for testing of the reduced television instruction. The tests were administered, one in the morning and one in the afternoon, for each of the three days of reduced television instruction. In addition, a retention test was administered about one month later.* This 70-item retention test was the same employed in the previous study (9).

Of the 296 items employed in the previous study, 234 were selected for use in the present one. Comparisons for all groups were based only on items common to all tests.

Trainees

The trainees were enlisted men entering training in the Power Maintenance Course of the Southeastern Signal Corps School, Fort Gordon, Georgia. They were assigned to the course by normal channels employed by the school. Information, including aptitude test scores of the trainees, was obtained from the "Individual Classification and Assignment" (ICA) cards supplied by the school's record branch. The trainees were not informed that they were participating in an experiment. However, television has been used for training at Fort Gordon during the past six years, and is not considered a novel method of instruction.

Television Facilities and Personnel

The closed circuit television facilities at Fort Gordon, and its personnel, were made available for carrying out the present study. Since this study immediately followed the previous one, most of these personnel were familiar with the requirements for preparing materials, presentations, etc.

* See Appendix D for testing schedule.

The Television Branch at Fort Gordon has for many years employed television for the training requirements of the Signal Corps School, maintaining a schedule of 30 to 40 hours of varied television instruction. A major mission of the Fort Gordon television installation has been to serve as a laboratory and test facility for the development of Army television. It possesses a complete three camera image-orthicon facility, additional standby cameras, and other supporting equipment. It was the first military installation to acquire and demonstrate the usefulness of prompting equipment for television training.

General Design and Study Procedures

The study was divided into three phases:

Phase I: The development and testing of a reduced television presentation to be taught by experienced instructors. These instructors had previously taught the first week of the Power Maintenance Course by conventional classroom methods. Comparisons of teaching effectiveness were based on trainee test scores achieved after receiving reduced television instruction or the conventional five day instruction.* This reduced television instruction was repeated four times to four different groups of trainees.

Phase II: Two instructors were trained to teach the reduced television presentation. Comparisons were made between the new and the experienced instructors giving the television instruction. This television instruction was repeated three times to three different groups.

Phase III: The television instruction, as given by experienced instructors, was recorded on film (kinescoped) and used for teaching. Comparisons were made with Phase I and Phase II teaching results. These television recordings were presented three times to three different groups.

Duplicated Experimental Conditions

Since, as discussed, this particular study was an extension of the study dealing with the intensive exposure to television (9), all of the experimental conditions, except for those noted previously, were identical. Facilities, such as classrooms used, television monitors, practical exercise laboratories, administrative procedures, such as techniques used in the analysis of test scores, giving and scoring of tests; the means of the selecting the students, -- all were identical.**

* See Appendices C and D for actual times allotted to instruction.

** One difference was that the first study was conducted during late winter and early spring, and the present study took place during late summer and early fall.

A two-unit prompting equipment was used: (1) a master control operated by the instructor, who set and governed the speed of delivery; and (2) a "slave" which contained approximately 30-minutes worth of script in large type, running vertically down a roller system at a speed regulated by the master control. With the slave mounted on a television camera, the instructor could follow carefully the written script and yet give the illusion of naturalness and spontaneity.

It was not possible to obtain full use of the special effects equipment which produces camera techniques such as split-screen, wipes, sweeps, fades, etc. This was a decided limitation to the full effective use of television instruction.

Instruction materials for television were prepared by two enlisted script writers. These men were not training specialists but were familiar with the content of the materials and followed guidelines and instruction from the research personnel.

Chapter II

EXPERIMENTAL PROCEDURES

The Guidelines for Preparing Reduced Television Training Presentations

Teaching objectives contained in the lesson plans for the original 38 hours of instruction of the Power Maintenance Course were the framework upon which the reduced television instruction was based. Two military script writers used the following guidelines in preparing the television scripts:

1. An arbitrary half-hour length was established for each unit of instruction. Direct observation and suggestive leads from other television and film studies, indicated that, beyond 30 minutes of instruction, distraction or fatigue increased rapidly. Another reason stemmed from the limited time conditions in the study. There was opportunity for only one attempt to achieve the desired reduction. The proposed half-hour length of instruction would cut 20 minutes from each of the original 38 hours of instruction, and would represent a goal worthy of achievement in terms of time and costs saved.*

2. Teaching materials were to be examined with a view to eliminating random repetition, unnecessary wordage, difficult explanations, obscure language and similar factors. This procedure, of course, is not unique in preparing television instruction but can be applied to any method of teaching.

3. At every opportunity, the television camera's ability to combine visual and verbal information by superimposures, title cards, split-screen techniques would be employed. Picture, words, demonstration would be interwoven to reinforce teaching points.

4. Oral and written participation would be used to reduce student passivity and boredom as well as to reinforce difficult teaching points.

5. The scripts would be training oriented, with major emphasis on demonstrations, diagrams, practical exercises, rather than upon the instructor. The television camera would be focused only upon these critical aspects of the instruction.

6. Each unit of instruction would follow the following format: Review of previous or related instruction; introduction of key teaching points to be covered by the lesson; development and demonstration of these key points; a final summary and review of key points covered in the lessons.

* The standard length of the conventional teaching "hour" is 50 minutes.

7. Each new concept idea or definition would be reinforced by title cards, superimposures and similar visual aids; difficult or "jargonistic" language would be replaced by simpler language. Mnenomic devices would be used when possible.*

8. Whenever possible, bulky and expensive training aids would be replaced by simpler diagrams, charts or similar inexpensive devices, or by using actual equipment.

Constructing the Television Scripts and Presentations

Without changing the lesson plan objectives, the conventional 38 hours of instruction were organized into 38-half-hour units, and the script writers assigned responsibility for a particular sequence of hours, e.g., Magnetism, Ohm's Law, etc. Each lesson plan was studied by the script writer and an instructor or technical advisor for accuracy and completeness. In some instances, sketchy lesson plans required research in technical journals and field manuals, and complete rewriting of the lecture. Meetings were held to discuss how unsatisfactory portions of a lesson might be improved by rewriting, using visual aids, or similar methods.

This analysis led to a further reduction of the television instruction to 32 half-hour periods or 16 hours from the original 38 hours of classroom instruction.**

The opening and summary sections of each half-hour of instruction were placed on the prompter. Because only 10minutes intervened between the half-hour instruction periods, there was not sufficient time to rewind and use the prompter for each period of teaching. Therefore, the bulk of narration was read off-screen by the instructor, while any demonstrations were done by television personnel on-screen. This procedure permitted the instructor to watch the monitor, and control his speaking rate and presentation.

Preparation of Instructor and Television Personnel

To insure efficient and uniform production, the television and instruction personnel were divided into two teams. Each team consisted of a director, two floormen or assistant directors, a demonstrator, two cameramen and one instructor. Since only one studio was available,for all classes, the two teams alternated in the telecasting of each period.

* One mnemonic device used was a triangle to explain Ohm's Law. The three letters, E (voltage), I (Current), and R (resistance) were given various positions in the triangle to indicate required multiplication or division when using this law. As a constant reminder, this triangle was superimposed on the circuit boards during problem solving periods in the television instruction.

** See appendices C and D for comparisons of previous schedule and revised schedule.

The other activities of the Television Branch, a tight time schedule, and the experimental conditions themselves (trying to set up minimum requirements for instructors) kept rehearsal time to a minimum. Most of the rehearsal time was concentrated on getting the production and studio crews to operate in the synchronized fashion necessary for a split-second operation.

Approximately one hour of rehearsal time was scheduled for each hour of actual programming. This amounted to about 20 hours for each instructor. Of specific interest is the time spent with the two inexperienced instructors who had never taught a course before. In fact, they knew nothing more about electricity than the average layman, and had never been on television before.*

Normally, in order to qualify as an instructor for the Power Maintenance Course, each man had to take the 10-week course himself as well as the three week instructor training program. This would amount to four months spent in preparatory time alone. For purposes of this experiment, the inexperienced instructors spent less than one week in actual preparations. The implications of this will be discussed in detail in the "Discussion" section of this report.

Preparation of Visual Aids

Wherever possible, existing training aids, which had been designed to teach large-size classes and therefore were usually large and quite unwieldy for television use, were replaced by simple diagrams, cards, and most often by the actual equipment itself. Ten-penny nails were used to represent three to five foot driving rods; buckets of sand simulated acres of soil; paper clips represented magnetized metals; photographs depicted complex equipments.

Specific examples of changes in visual aids are:

1. Multimeter:

This visual aid, some seven-feet high, illustrated the use of this device to measure resistance, current, etc., in circuits. Its cost of preparation was $125. For the television presentation an actual multimeter costing $41.00 was used. See figures 1 and 2.

2. Hydrometer:

This four-foot visual aid represented a measuring device which indicated the specific gravity of the electrolyte in a battery. Its cost of preparation was $85. It was replaced by an actual hydrometer costing $4.00 during the battery charging demonstrations. See Figure 3.

* As further evidence of their lack of knowledge about electricity, after they had taught over television for three weeks, they were given the retention test usually administered to students after completion of the course. They were not able to pass it successfully.

3. D'Arsonval Meter-Movement:

This three-foot training aid represented the innerworkings behind the registration of readings for meters to be used in the course. It was prepared at a cost of $264. For television, it was replaced by a simple calibrated card and an actual multimeter, costing $46.00.

Television Recordings

After the television instruction by the experienced instructors had been given two times, kinescoped recordings were made of their presentation. These recordings were later used to teach the trainees. The only television personnel required for the kinescope instruction was an engineer to transmit the kinescope.

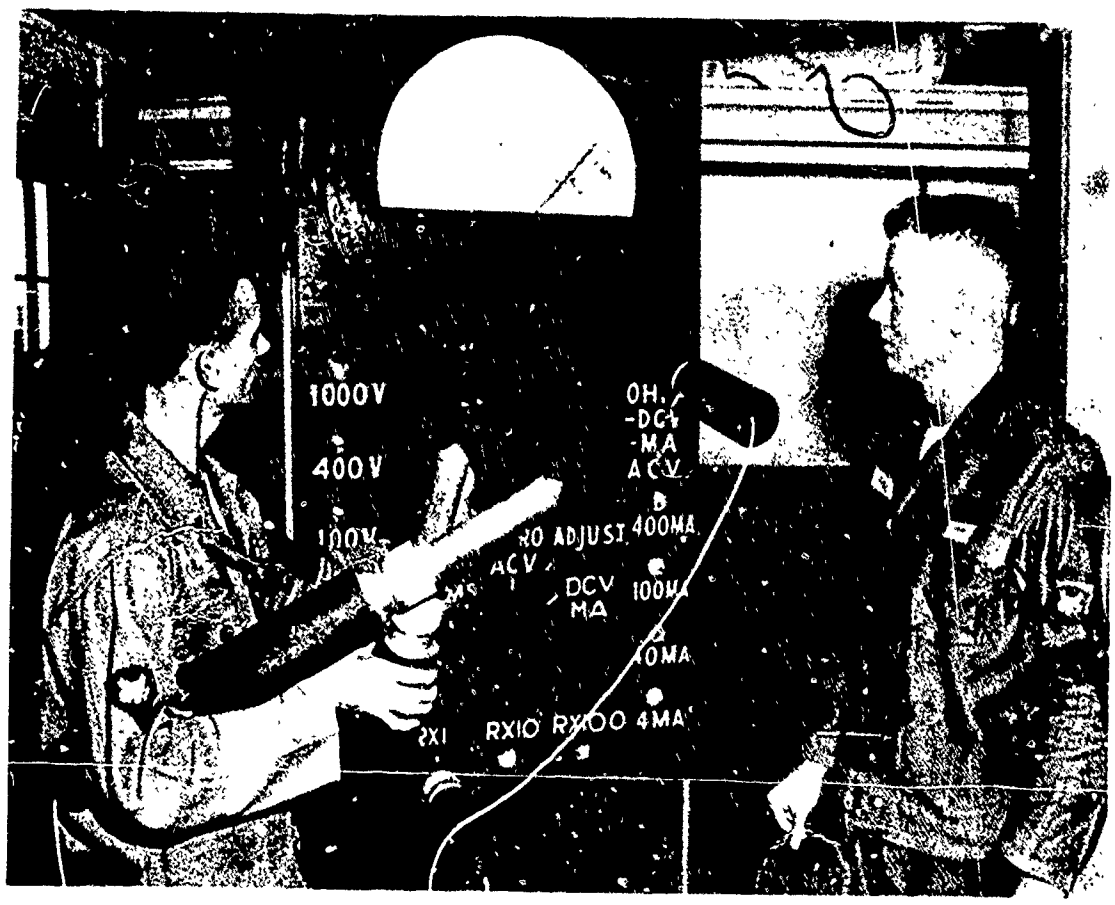

Figure 1. Multimeter Training Aid used in regular instruction

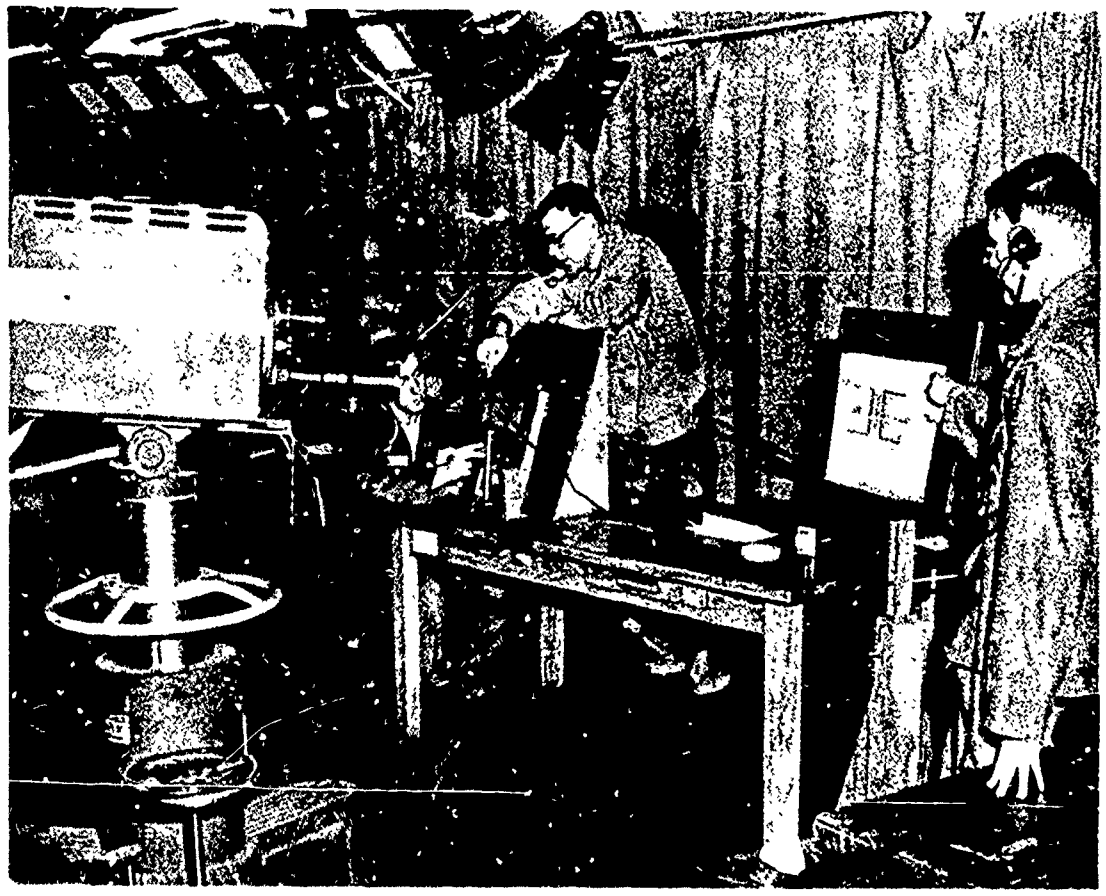

Figure 2. Actual multimeter used in reduced television instruction

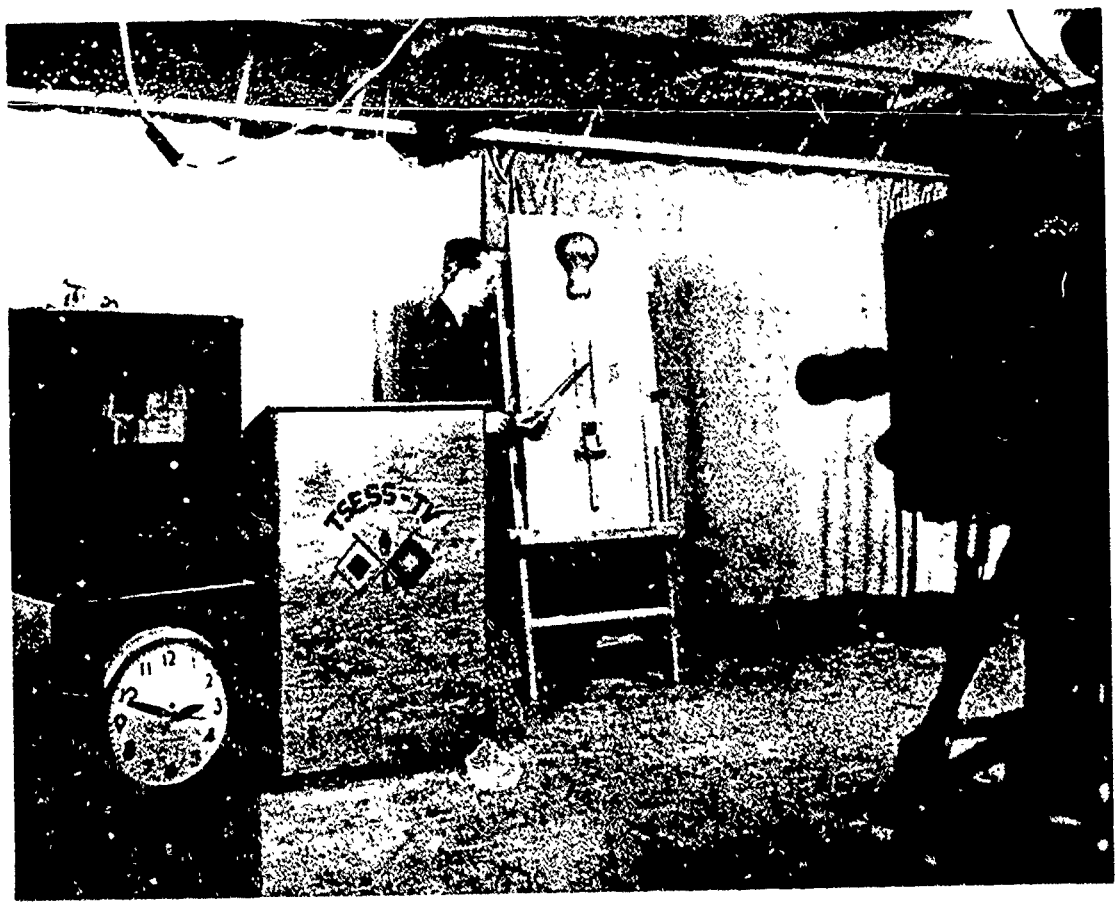

Figure 3. Hydrometer training aid

Chapter III

ANALYSIS OF RESULTS

Results

Comparisons are based on the tests given immediately after instruction and a 70-item retention test given about one month later. Trainee's test scores for the 38-hour conventional and "intensive" television groups are based on the number of items right of the 234 test questions used for these groups.* In order to equate for aptitude differences among the trainees, a post-selection procedure was employed.** The mean scores for the five methods of training employed are presented in Table 1.

Table 1

Mean Test Scores for Experimental Groups

METHOD OF TEACHING	IMMEDIATE TEST SCORES	RETENTION TEST SCORES
38-hr conventional, 5 days	132.5	39.4
38-hr intensive TV, 5 days	114.6	37.3
16-hr reduced TV, 3 days (experienced instructors)	104.0	30.8
16-hr reduced TV, 3 days (inexperienced instructors)	100.2	31.2
16-hr reduced TV, 3 days (kinescopes)	107.0	31.4

* Ideally, it would have been more desirable to have trained and tested the 38-hour groups closer in time to the other experimental conditions. However, although the present and previous study (9) are reported separately, they presented a continuous study over a six-months period, and it was not possible because of time and administrative limits, to reform the 38-hour training program for testing. One result, discussed later, was that the 38-hour groups were trained and tested under more ideal weather conditions than the reduced television groups.

** A description of this procedure is contained in Appendix A.

To determine the effects of these five methods upon high and low aptitude personnel, 17 low aptitude personnel (below the 40th percentile of the total sample), and 19 high aptitude trainees (above the 60th percentile of the total sample) were selected. The test performance of these trainees under the five training methods is indicated in Table 2.

Table 2

Mean Immediate Test Scores for High and Low Aptitude Trainees

METHOD OF TEACHING	HIGH APTITUDE	LOW APTITUDE
38-hour conventional	156.6	108.9
38-hour intensive TV	125.0	110.4
16-hour reduced TV (experienced instructors)	117.7	90.6
16-hour reduced TV (inexperienced instructors)	114.8	85.9
16-hour reduced TV (kinescopes)	122.0	92.4

Statistical Analyses

Analyses of variance and the "t" test were used to test the statistical significance of the differences among the various study conditions.* The results of these analyses indicate the following:

1. The learning and retention of trainees receiving 38 hours of conventional classroom or television instruction were superior to that produced by any of the 16 hours television training methods.

2. Trainee learning from inexperienced instructors was as effective as from experienced instructors in teaching 16 hours of television instruction.

3. Trainee learning from the use of 16 hours of kinescope instruction was as effective as 16 hours of "live" television with experienced instructors.

4. There was no significant difference in trainee retention of learning among the reduced television instruction by experienced and inexperienced instructors and kinescopes.

* A summary of these statistics is presented in Appendix B.

5. The immediate learning of high aptitude trainees receiving 16 hours of television instruction was at least as effective as that of low aptitude trainees receiving 38 hours of classroom or television instruction.

End of Course Completion of Trainees in the Five Methods of Instruction

Failure to complete a course or "washback" by a trainee does not reflect the effect of small differences in teaching effectiveness, but it does provide an indication of gross differences. Information was obtained on the number of such trainee failures for the Power Maintenance Course to determine if there were any significant differences among the five methods of instruction. Table 3 presents the number of trainees from each of these five methods who were eventually dropped from the course.

Table 3

Number of Trainees dropped from the Power Maintenance Course

METHOD OF TEACHING	NUMBER COMPLETING COURSE	NUMBER DROPPED
38-hour conventional	42	5
38-hour television	38	9
16-hour television (experienced instructors)	43	4
16-hour television (inexperienced instructors)	41	6
16-hour kinescope instruction	44	3
TOTAL:	208	27

Statistical analysis indicated no significant relationship between number dropped and method of teaching.* It may be concluded that the differences in test scores produced by the five methods of teaching were of little consequence in terms of course completion.

* A chi-square test administered to this data was not significant at the 5% level of confidence (chi-square = 4.44, df = 4).

Chapter IV

DISCUSSION OF RESULTS

Following guidelines previously described, two enlisted script writers reduced the training time of a five-day period of conventional classroom instruction to three days of television instruction. This reduction represented a single attempt since there was no time to go back and improve any portion of the television. While the teaching effectiveness of the three day television instruction fell below that of the five day instruction, there are at least three effective procedures for overcoming these differences: (1) Revising and improving particular aspects of the television training as pinpointed by trainee test scores; (2) Using part of the remaining two days for additional training or review; (3) Additional training or review later in the course.

Interpretation of the Losses in Training Efficiency

The television instruction achieved a 43% reduction in training time. The loss in training efficiency was also calculated.*

* To evaluate loss in training efficiency, the following formula employed:

$$\frac{\bar{X}\ \text{Reduced TV} - \bar{X}\ \text{Control}}{\bar{X}\ \text{Control} - \frac{\text{No. of Items in Test}}{4}}$$

This formula takes into account the effect of chance on test score by subtracting one fourth (all items were 4 alternative multiple-choice items) of the number of items in the test from the control means in the subtrahend of the formula. Because there were no differences between the means for the various reduced TV groups, the average of the three means was used. The average for retention means of the control groups (38 hour instruction groups) was employed for the same reason.

The results for learning were a 20% loss using the 38-hour television instruction for comparison; and a 39% loss in learning using the 38-hour classroom instruction for comparison.* In no case did the loss in teaching effectiveness equal the reduction in training time.

Reduction in Training Time

The 43% reduction in training time, the major treatment variable, would be expected to have a detrimental effect upon training efficiency. There is no basis at present for deciding the expected size of the reduction in training efficiency that would result from a given reduction in training time.

Preparation of Television Instruction

The television instruction represented a drastic revision of the original 38 hours of instruction. It is likely that these revisions resulted in increased training efficiency, counteracting the losses resulting from training time reduction and other factors. While the scripts followed certain guidelines and were written with a view to improving instruction, previous experience (3) would indicate that it was unlikely these first scripts were the best possible presentations. Time precluded using the procedure of testing and revising the scripts. (3). The results of this study lead to the recommendation that this procedure be employed in conjunction with the guidelines for reducing training time.

* The question arises as to which control condition is the appropriate baseline for evaluating the effects of the reduction in training time on training efficiency, i.e., should the 38-hour regular instruction condition or the 38-hour television instruction condition be used as a baseline. The use of the 38-hour regular instruction condition as a baseline would introduce an additional variable which would confound the interpretation of the results. That is, the loss in training efficiency between the regular instruction condition and the reduced television instruction conditions would be due not only to the reduction in training time, but also to the change of medium from the regular procedure to television. A comparison of regular instruction with 38-hour television instruction, and a comparison of 38-hour television instruction with reduced television would take into account the reduction in training time. Thus, the 38-hour television condition is the appropriate baseline for evaluating the effects of the reduction in training time, and the 19.6% loss in learning and the 34.6% loss in retention must be used as estimates of the effect of the treatment variables employed in this study.

Reduction in Testing Time

Trainees receiving the 38 hours of classroom or television instruction had approximately 50 seconds to answer each item. Because of time limitations, trainees receiving the 16 hours of television and kinescope instruction had approximately 40 seconds to answer each item. This 10-second difference was probably detrimental to the test achievement of these television trainees.

Difference in Weather Conditions

The 38 hours of classroom and television instruction were taught during late winter and early spring at Fort Gordon. The reduced television instruction was given in late summer and early fall. There were radical differences in temperatures and humidity in the classrooms during these periods, reflecting the effects of mild winter and hot summer weather. Temperatures of 100 degrees F are not uncommon at Fort Gordon during the summer, and it is likely that the classroom discomfiture of trainees receiving the 16-hour television instruction was not as conducive to learning as the milder weather conditions experienced by the trainees receiving the 38 hours of classroom or television instruction.

Other Observations

No systematic attempt was made to observe or measure trainee reactions to the various forms of instruction used in these studies. However, visits were made to various classrooms undergoing the 38-hour and 16-hour instruction series. There were some striking differences apparent even to the cursory observer. The 38-hour instruction conditions, whether given by television or by regular instruction, were dull. Trainee distraction and boredom appeared very rapidly after instruction began. The reduced television and kinescope instruction were briskly presented, and appeared to hold trainee attention throughout. The half-hour instruction limit appeared to be a good one in terms of not exceeding trainee endurance and attention. These observations strengthened the belief that had time permitted, it would have been possible to eliminate the small day to day learning differences between the 38-hour and 16-hour instruction methods.

Combined Effect of the Varied Conditions

To sum up, three factors - reduction in training time, reduction in test time, and unfavorable weather conditions would act to reduce the learning and retention scores of the reduced television groups. One factor of improvement in the television presentations, would act to increase these scores. Although correct weightings cannot be given to each of the four factors, one might expect the net losses to be much greater than they actually were.

Discussion of Other Results

Learning and Aptitude

One of the findings of this study is that high aptitude trainees learned as well or better from 16 hours of instruction as did low aptitude trainees from 38 hours of instruction. One of the implications of this finding is the desirability of using a different selection process for course assignment of trainees. From a training viewpoint, separation and training of high and low aptitude personnel would facilitate teaching problems. In mixed groups, the instructor who gears his teaching to abilities of the lower aptitude personnel, cannot capitalize upon the superior learning potential of the higher aptitude personnel. Likewise, teaching at the pace which higher aptitude personnel can learn will generally impair and confuse learning of the lower aptitude trainees. Where there is a wide range of aptitude present among trainees, the tasks of improving teaching effectiveness, reducing training time and similar activities are difficult to achieve.

Rapid Training of New Instructors

Confirming the findings of a previous study (3), it was found possible to rapidly train (one week) two new television instructors, in a fraction of the time (about 3 - 4 months) required for conventional instruction, and have them teach as effectively as experienced instructors. Again it was found that prompting equipment was invaluable in achieving this rapid training.

The Use of Television Recordings for Training

The results of this study indicate that 16 hours of training by television recordings (kinescopes) were as effective as similar "live" television instruction by experienced instructors or inexperienced instructors. These findings extend the range of usefulness of such recordings for military training purposes (7, 10, 13). It should be noted that this was the most intensive employment of films for teaching yet reported in the field of audio-visual research (5). An important implication in this finding for Army training lies in the use of films for teaching more extensive segments of military training than is now being done. Entire courses or sections of courses can probably be converted to film teaching. Such a procedure would serve to standardize instruction within or among Army installations, achieve many cost savings and be available for mass training during emergency or mobilization conditions.

Preparation of Television Presentations

One of the objectives of the present study was to determine if preparation of effective television teaching presentations was possible by non-research personnel. The military script writers, following the guidelines outlined for them, showed great skill and resourcefulness in such preparation. The testing skills which would be needed to

evaluate teaching effectiveness are often available among the instructional staff of an installation, or may be part of the mission of a specific branch which generally examines the training effectiveness of various courses, such as the Testing Branch at Fort Gordon.

The Use of Television to Reduce Military Training Time

A number of questions arise in connection with the use of television to reduce training time. One of these is if similar efforts can be made with conventional instruction without the use of television and a corollary - if there are any features of television which uniquely contribute to reducing training time.

The answer to the first question is Yes. Successful attempts have been made to reduce conventional teaching time without using television (2). Nor is it the contention of this study that only television can achieve reductions in training time. However, the particular role and usefulness of television becomes apparent when analyzing the steps and efforts required to reduce training time.

The reduction of training time may be broken down into two aspects - teaching techniques and administrative factors. Teaching techniques are concerned with the learning process and involve effective use of such factors as repetition, picture-word associations, explanations, etc. Where television differs from class-room procedures is in its ability to manipulate, combine and control pictorial and verbal materials.

In simpler subject matters, some approximation of this ability may be made in the classroom. Where more difficult subject matters are involved, especially with complex equipments, it is difficult to rival television's ability to effectively combine visual and verbal information. To this must be added the ability of the television camera to focus only upon what it critical for learning - a particular piece of equipment - and to bring it closeup view if necessary. The availability of such television presentation features as closeups, split-screen, superimposures, provide the television teacher with instructional resources difficult to duplicate with classroom methods.

As pointed out in the body of this study, many things such as eliminating needless repetition or simplifying or improving language are not unique to television. But when the requirement arises for inserting additional repetition or reinforcing a teaching point, then television possess more features and techniques than are available in the classroom.

The second aspect, administrative factors, refers to the time and effort required to change and modify instruction when trying to achieve reductions in time. Included also are the standardization and conservation of the reduced instruction.

By whatever methods, reducing the training time of an existing bloc of instruction is time consuming. One activity requiring time is instructor training. After the materials have been rewritten, it is necessary to train the instructor to present them as prepared and without change with succeeding teaching presentations. In the classroom, this is difficult. It takes time to learn a thirty-minute lecture and with succeeding presentations, the factor of human variation enters so that materials and words may undergo change.

Television, in combination with a prompting device, radically reduces these problems. It is possible to make complete daily changes in instruction with little effort required to memorize or learn these changes by the instructor since he can read them from the prompter. The prompter also insures standardization of the presentation no matter how many times it is given.

To this picture must be added the fact that there is great turnover of military instructors. The usefulness of the prompter in rapidly training new instructors to an effective level has already been described in this report. It is apparent then that television can considerably reduce the effort involved in teaching time reduction and insure that such efforts are not dissipated due to instructor variation or turnover.

In summary, reduction of training time may be achieved without television. Television, however, is an effective vehicle for achieving such reductions because of its pictorial flexibility and its administrative advantages in reducing the efforts required for reducing training time.

Chapter V

EXPERIENCED INSTRUCTORS, INEXPERIENCED INSTRUCTORS, AND KINESCOPE RECORDINGS

The equivalence in teaching effectiveness of experienced instructors, inexperienced instructors, and kinescope recordings indicates that, in television presentations of the type employed in this study, any of the three arrangements may be employed. These results have important implications for the potential use of television in Army training.

The Use of Inexperienced Instructors

The Army has difficulty in obtaining instructors for the teaching of highly technical subject matters. The usual procedure for training instructors, as previously described, reduces the instructor's productive time in service, and may also be questioned as to its effectiveness. By means of television and prompting equipment, it is possible to take a person with no knowledge of a given course's material, with none of the special skills required of a good instructor, give that person about one or two hours of rehearsal per hour of television instruction, and present this instruction to trainees with no loss in training efficiency. The results of this study are in support of this statement, and are consistent with previous results (3). It is in this way that television can help in solving the problem created by the shortage of adequate instructors.

The Use of Kinescope Recordings*

Once a television presentation is developed to the point where it effectively teaches a given subject matter, a kinescope recording can be made of the "live" presentation. Such a procedure can result in savings in time, money, and effort. The use of kinescope recordings in the present study indicates that this procedure may be used without any losses in training efficiency. It should be noted that this was the first time 16 hours of continuous film instruction have ever been attempted. The results of a previous study (10) pointed to the value of kinescopes for review training.

* The following excerpt from Letter, Southeastern Signal Corps School, Fort Gordon, Subject, TVR-MG-1, dated 13 March 1957, testifies to the value of the research kines:

"e. The 32 half-hour kinescopes produced and used during the Television Research and Evaluation project in the Principles of Electricity Phase, MOS 351 Course, have proved extremely valuable to USASSESS in the regular televised training. Though intended originally for experimental purposes only, the films were specifically requested for regular use by the MOS 351 Course. Scheduling proved easy enough. Even though a change in PCI has occurred since the experiment, 16 of the films are still applicable. After seeing these films on the closed circuit, personnel of another course (MOS 331) came forward and requested some of the films. In this course, the televised instruction is used for two purposes; to instruct students and to teach new instructors. Responsible personnel in this course testify to the value of these showings and to the tremendous assistance they provided in a period of extreme instructor shortage. The experience of the MOS 351 Course is similar to that of the 331 Course, except that they have directly used the kinescopes only for training students. Personnel of that course attest to values received from the kines, including good student interest and consistently high learning, support to new instructors (from the standpoints of subject matter learned, teaching techniques absorbed, and classroom shyness overcome), and the instructors saved. Actually, for evaluation purposes and for purposes of planning the provision and utilization of kinescopes and kinescope facilities, a great deal more has been learned from the research kines than from those made specifically under the kinescope program."

Chapter VI

TELEVISION COST FACTORS

The present study was not designed to produce a thorough comparative cost analysis of television and conventional classroom instruction. This task was difficult because television is brought in as an adjunct to a training installation already organized to meet the logistics of conventional instruction. For example, existing classrooms are used as television reception sites, although, in terms of size and viewing conditions these sites are not always the most efficient economically, or from a teaching viewpoint, for television teaching. A new, television oriented training installation would also require somewhat different organization and administration of its various courses. For example, pursuing the findings of this study, a pool of instructors available to teach any television subject might be more adaptable to television requirements. A more complete analysis would include overhead factors such as television equipment maintenance costs, personnel costs, numbers of students trained, etc. These cost factors were not determined by this study.

With these cautions in mind, certain savings related to television training were apparent in carrying out the present study, and these are presented as an indication of the nature of potential savings by television training.

Savings in Training Aids

Training aids employed in regular classroom instruction were not used in the reduced television versions. Actual equipment or charts were substituted for the training aid. The costs of training aids and their substitutes follows:

Table 4

COMPARATIVE TRAINING AID COSTS

	Regular Instruction	Television Instruction
Hydrometer	$ 85.00	$ 4.00
RA 21-Rectifier	436.00	5.00 (estimated)
D'Arsonval Meter Movement	264.00	5.00 (estimated)
Multimeter TV 297/U	125.00	41.00
TOTALS:	$910.00	$55.00

Any increases in the number of trainees taking the course will most likely result in an increased training aid requirement for regular instruction. For example, doubling the trainee input may increase training aid costs by as much as 100%. This is not the case with television instruction. Increases in trainee input would require the use of additional television monitors. In times of mobilization, when trainees input will greatly increase, large cost savings in training aids may result from the use of television.

Instructors

According to AR 35-247, the cost for a day's labor of an E-4 is $10.32. Four instructors were used to present the original five days of regular instruction and intensive television instruction. Only two instructors were used to present the three days of reduced television instruction. An increase in trainee input will most likely occasion increased instructor requirements for regular classroom instruction, but instructor requirements for television would be less. Table 5 presents instructor costs (using the E-4 pay rate) for 40 weeks of instruction with average trainee input per week being varied. In this table, it is assumed that tripling trainee input will double instructor requirements for regular instruction.

Total Cost of the Reduced Television Instruction

Cost figures were obtained for the reduced television instruction. Preparation costs, including personnel, equipment and supplies, were $13,980. The cost of one complete presentation was $590. The cost of forty presentations, including preparation costs, would be $37,580, or an average of $940 a week. Exact costs for preparing the original 38 hours of the introduction to the Power Maintenance are not available, but they probably exceed the cost of 16 hours of television instruction. With increased trainee input, television costs will remain stable, while regular instruction costs would increase for additional instructors, training aids, etc.

The Cost of Kinescope Recordings

The estimated cost of the sixteen hours of kinescope recordings was $1347, including the costs of raw film and developing. To this figure may be added the preparation costs of the reduced TV version of the instruction. These costs, plus the cost of a kinescope operator, result in an estimate of $16,560 as the cost of forty weeks of the kinescope version -- or an average weekly cost of $414. If the preparation costs of the live instruction upon which the kines were based are not included, the weekly cost of the kines would be about $34. Other advantages of kinescopes are:

(1) The loss of effective instructors is minimized if their material is on film.

(2) The instruction is standardized.

(3) Other installations may use the films. Both represent potential cost savings.

Table 5

COMPARATIVE INSTRUCTOR COSTS FOR 40 WEEKS OF INSTRUCTION AS DETERMINED BY METHOD OF INSTRUCTION AND TRAINEE INPUT

Trainee Input	5 Day Regular	5 Day Intensive TV	3 Day Reduced TV
30 # Instructors	4	4	2
Total Costs* @ $10.32 p.d.	$8256	$8256	$2477
Cost per student	$6.88	$6.88	$2.06
90 # Instructors	8	4	2
Total Costs* @ $10.32 p.d.	$16,512	$8256	$2477
Cost per student	$4.57	$2.29	$ .69
270 # Instructors	16	4	2
Total Costs* @ $10.32 p.d.	$33,024	$8256	$2477
Cost per student	$3.04	$ .76	$ .23

* Instructor overhead costs are not included.

Summary

1. "Live" television may be less expensive than conventional instruction, especially when trainee input is large, because of training aids and instructor cost savings.

2. Instruction by kinescope is less expensive than either "live" television or conventional instruction. This economy increases as trainee input increases and with successive use of the kinescopes. The possibility of their use by other installations or activities adds to their economy.

APPENDIX A

Selection of Sample

Only trainees completing all six tests were considered in the analysis. The numbers for each group are shown in Table 6.

Table 6

THE NUMBER OF SUBJECTS COMPLETING ALL TESTS

GROUP	N
Intensive regular instruction	78
Intensive TV instruction	64
Reduced TV experienced instructor	102
Reduced TV inexperienced instructor	72
Reduced TV kinescopes	103
Total:	419

The groups were equated for aptitude and the trainees' scores on the reading vocabulary, arithmetic reasoning, pattern analysis, and electrical information tests included in the Army General Classification Test Battery were employed for this purpose. Because of an artificial cutoff in the recorded electrical information test scores, a ranking procedure was employed. The total sample of 419 trainees were ranked according to test grades on each of the 4 tests considered, and the sum of the ranks on the four tests was used as the aptitude measure. The method employed for equating for aptitude was that of constituting aptitude levels. The analysis of covariance procedure was rejected because of the severe losses in the size of the sample that would result.

The levels were derived by dividing the total sample into 5 equal groups (representing the 20, 40, 60, 80 and 100 percentile). This resulted in the following breakdown of subjects:

N's in each cell of Treatments X Levels Table

Levels	Kine	Exp. Instr.	Inexp. Instr.	TV	Reg	Sum
I .20	25	34	17	(2)	5	83
II .40	15	19	17	18	(15)	84
III .60	20	22	19	12	(11)	84
IV .80	22	18	(12)	14	18	84
V 1.00	21	9	(7)	18	29	84
Sum	103	102	72	64	78	419

From the total sample an equal number of trainees from each treatment was selected at random for any given level, the number of trainees in each cell being decided by the smallest size cell of the given level, i.e., 2 for level I, 15 for level II, 11 for level III, 12 for level IV, and 7 for level V. The N's for the selected sample are given below:

Final Sample
Treatments

Levels	Kine	Exp.	Inexp.	TV	Reg	Sum
I	2	2	2	2	2	10
II	15	15	15	15	15	75
III	11	11	11	11	11	55
IV	12	12	12	12	12	60
V	7	7	7	7	7	35
Sum	47	47	47	47	47	235

An analysis of variance test administered to the aptitude measure resulted in an insignificant F for treatments, indicating that the matching for aptitude was adequate. The size of the sample employed in the analysis of retention data was smaller than that employed for original learning because of subjects' failing to take the retention test. The N's for retention follow:

Sample Employed in Retention

Data Analysis

Level Treatment	Kine	E	INE	TV	REG	Rows
II	11	11	11	11	11	55
III	6	6	6	6	6	30
IV	10	10	10	10	10	50
V	7	7	7	7	7	35
Sum	34	34	34	34	34	170

APPENDIX B

STATISTICAL ANALYSES OF RESULTS

1. Analysis of Variance: Total Score (Learning)

Source	df	ms	F
Treatments	4	7,677.30	17.79*
Levels	4	13,961.23	32.35*
Interaction	16	518.34	1.20
Within	210	431.52	

* F (df = 4, 120) at the 5% level of confidence is 2.37

2. t Tests for Learning Means

Treatment$_1$	Treatment$_2$ Reduced TV Exp. Instr. $\bar{X}_1 - \bar{X}_2$	t*	Reduced TV Inexp. Instr. $\bar{X}_1 - \bar{X}_2$	t*	Intensive TV $\bar{X}_1 - \bar{X}_2$	t*	Intensive Regular $\bar{X}_1 - \bar{X}_2$	t*
Reduced TV Kinescope	3.00	.70	6.77	1.58	-7.64	1.78	-25.49	5.94*
Reduced TV Exp. Instr.			3.77	.88	-10.64	2.48*	-28.49	6.64*
Reduced TV Inexp. Instr.					-14.41	3.36*	-32.26	7.52*
Intensive TV							-17.85	4.16*

* $t = \dfrac{\bar{X}_1 - \bar{X}_2}{\sqrt{\dfrac{2ms\ (within)}{n}}} \qquad \dfrac{\bar{X}_1 - \bar{X}_2}{4.29}$

* t (df = 210) at the 5% level of confidence is 1.97

3. Analysis of Variance of Retention Data

Source	df	ms	F
Treatments	4	553.11	8.48*
Levels	3	1327.48	20.36**
Interaction	12	65.03	1
Within	150	65.20	

* F (df = 4, 120) at 5% level of confidence is 2.45.
**F (df = 3, 120) at 5% level of confidence is 2.68.

4. t Tests of Differences between Various Treatments

	Reduced TV Exp. Instr.		Reduced TV Inexp. Instr.		Intensive TV		Regular Intensive	
Treatment$_1$	$\bar{X}_1 - \bar{X}_2$	t*	$\bar{X}_1 - \bar{X}_2$	t*	$\bar{X}_1 - \bar{X}_2$	t*	$\bar{X}_1 - \bar{X}_2$	t*
Reduced TV Kinescope	.62	.32	.18	.09	-5.88	3.00*	-8.03	4.10*
Reduced TV Exp. Instr.			-.44	.22	-6.50	3.32*	-8.65	4.41*
Reduced TV Inexp. Instr.					-6.06	3.09*	-8.21	4.19*
Intensive TV							-2.15	1.10

* $t = \dfrac{\bar{X}_1 - \bar{X}_2}{\bar{X}_1 - \bar{X}_2} = \dfrac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{2ms\ (within)}{N}}}$ 1.96

* t (df = 150) at the 5% level of confidence is 1.97.

APPENDIX C

REGULAR INSTRUCTION SCHEDULE

		D A Y				
Period	Time	Wednesday	Thursday	Friday	Monday	Tuesday
	Lecturer	A	B	C	D	B
1	0710 Subject	First-Aid	Multimeter	Ohm's Law	Review	Transformer-Connections
	0753 Format	Conference-Demonstration	Conference-Demonstration	Conference Demonstration	Conference	Conference-Demonstration
2	Lecturer	B	C	A	B	C
	0803 Subject	Magnetism	Use of Test Equipment	Problems	Grounds	Transformer Connections
	0846 Format	Conference	Practical Exercise	Practical Exercise	Conference	Practical Exercise
3	Lecturer	C	A	B	C	A
	0856 Subject	Electricity & Magnetism	Principle of Series Circuits	Application	Installation of Grounds	Storage Batteries
	0939 Format	Conference Training Film	Conference	Practical Exercise	Conference	Conference
4	Lecturer	D	D	D	B	D
	0949 Subject	Magnets	Ohm's Law	Application	Electro-Magnetism	Battery Connections
	1032 Format	Conference	Conference	Practical Exercise	Conference	Conference

APPENDIX C (contd) REGULAR INSTRUCTION SCHEDULE

Period	Time		DAY Wednesday	Thursday	Friday	Monday	Tuesday
		Lecturer	B	B	A	A	A
5	1042	Subject	Principles of Magnetism	Ohm's Law	Diagrams	Induction	RA-91 Rectifier
	1125	Format	Conference	Training Film Demonstration	Conference	Conference	Conference
TEST	1124-1200						
6		Lecturer	C	A	C	C	C
	1325	Subject	Magnetic Fields	Problem Solving	Diagram Reading	Types of Induction	Operation of Rectifier
	1408	Format	Conference	Practical Exercise	Conference Demonstration	Conference Demonstration	Training Films
7		Lecturer	D	D	D	D	D
	1418	Subject	Meters	Application	Tracing Circuits	Fundamentals of Transformers	Records
	1501	Format	Conference Demonstration	Practical Exercise	Practical Exercise	Conference	Conference Demonstration
8		Lecturer		C		A	B
	1511	Subject	TESTED 1501-1520	Parallel Circuits	TESTED 1501-1520	Types of Transformers	Preparation for Battery Charging
	1554	Format		Conference		Conference Demonstration	Practical Exercise
TEST	1554-1620		No Test		No Test		

APPENDIX D

REDUCED TELEVISION INSTRUCTION SCHEDULE

TUESDAY - "How to learn from TV and First Aid" - (1100-1130) - During General Orientation. Whitman-Dr.

NO.	WEDNESDAY
1.	0710-0740 - Records
2.	0745-0815 - Magnetism
3.	0825-0855 - Magnets
4,	0900-0930 - Magnetic Fields (TF 11-622)
5.	0940-1010 - Electricity and Magnetism
	1015-1055 - Test
6.	1055-1125 - Ohm's Law Intro
7.	1130-1200 - Meters LUNCH
8.	1330-1355 - Multimeters
9.	1400-1425 - Meters Prac Exercise
10.	1430-1455 - Multimeter Prac Exercise
	1500-1520 - Test

NO.	THURSDAY
11	0710-0740 - Electromagnetism
12	0745-0815 - Induction Transformers
13	0825-0855 - Fundamental of Transformers
14	0900-0930 - Types of Transformers
15	0940-1010 - Transformer Connections
16	1015-1045 - Prac Exercises
	1050-1125 - Test
17	1130-1200 - Diagrams LUNCH
18	1330-1400 - Diagram Reading
19	1405-1435 - Series Circuits
20	1445-1515 - Parallel Circuits
	1515-1545 - Tests
21	1550-1620 - Series Circuits Problem Solving

NO.	FRIDAY
22	0710-0740 - Series Circuits Prac Exercise
23	0745-0815 - Parallel Circuits Problem Solving
24	0825-0855 - Parallel Circuits Prac Exercises
25	0900-0930 - Grounds
26	0940-1010 - Installation of Grounds
	1015-1055 - Test
27	1055-1125 - Storage Batteries
28	1130-1200 - Battery Connections LUNCH
29	1330-1355 - RA-91 Rectifier
30	1400-1425 - Battery Charging (TV 11-1219)
31	1430-1455 - Battery Charging Prac Exercise
	1500-1520 - Tests

NOTE: 5-Minute stretches in classroom. 10-Minute breaks outside class.

BIBLIOGRAPHY

1. CARPENTER, C.R., and GREENHILL, L.P. An Investigation of Closed Circuit Television for Teaching University Courses. University Park, Pa., The Pennsylvania State University, July 1955.

2. CLINE, VICTOR B., BEALS, A., and SEIDMAN, D. Evaluation of Four-Week and Eight-Week Basic Training for Men of Various Intelligence Levels. Technical Report 32. Washington, D. C. Human Resources Research Office, George Washington University, 1956.

3. DESIDERATO, OTELLO L.: KANNER, JOSEPH H.: and RUNYON, RICHARD P. Procedures for Improving Television Instruction. Audio-Visual Communication Review 4:57-63; Winter 1956.

4. FRITZ, MARTIN P. Survey of Television Utilization in Army Training. Human Engineering Report 530-01-1. Port Washington, N. Y.

5. HOBAN, C.F. JR. and VAN ORMER, EDWARD B. Instructional Film Research (Rapid Mass Learning). NAVEXOS, p 977, 1953. Special Devices Center, N. Y.

6. HUSBAND, RICHARD W. Television vs. Classroom Learning General Psychology. American Psychologist 9:181-83: May 1954.

7. JACKSON, ROBERT. Learning from Kinescopes and Films. Technical Report SDC 20-TV-1. Port Washington, LI., N.Y.; Special Devices Center, U. S. Department of the Navy, 1952.

8. KANNER, J. H., Future Trends in Television Teaching and Research, Audio-Visual Communication Review 5: Fall 1957, 513-527.

9. KANNER, JOSEPH H.: KATZ, SANFORD: GOLDSMITH, PETER B. Television in Army Training; Evaluation of "Intensive" Television in Electricity, Army Pictorial Center, January 1958.

10. KANNER, JOSEPH H.: RUNYON, RICHARD P.: and DESIDERATO, OTELLO L. Television in Army Training: Evaluation of Television in Army Basic Training. Technical Report 14. Washington, D. C.: Human Resources Research Office, George Washington University, 1954.

11. KANNER, JOSEPH H.: RUNYON, RICHARD P.: and DESIDERATO, OTELLO L. Television as a Training and Educational Medium. Audio-Visual Communication Review 3: 163-72; Summer 1955.

12. POLLOCK, TC., CARGILL, O., LOOMIS, J., & ZORBAUGH, H. Closed-Circuit Television as a Medium of Instruction, 1955-1956, New York University, New York, 1956, 56 pp.

13. ROCK, ROBERT T., JR.: DUVA, JAMES S.: and MURRAY, JOHN E. Training by Television: Comparative Effectiveness of Instruction by Television, Television Recordings and Conventional Classroom Procedures. NAVEXOS, Port Washington, L.I., N.Y.; Special Devices Center, U. S. Department of the Navy, p.850-52.

14. ROCK, ROBERT T., JR.: DUVA, JAMES S.: and MURRAY, JOHN E. Training by Television: A Study in Learning and Retention. NAVEXOS, Port Washington, L.I., N.Y.: Special Devices Center, U. S. Department of the Navy, p.850-53.

15. RUNYON, RICHARD P.: DESIDERATO, OTELLO L.: and KANNER, JOSEPH H. Factors Leading to Effective TV Instruction. Audio-Visual Communications Review 3:264-73; Fall 1955.

16. RUNYON, RICHARD P.: KANNER, JOSEPH H. Present Status of Signal Corps Television Research. Audio-Visual Communication Review 4: No. 2: 83-91; Spring 1956.

17. STODDARD, A. J. Schools for Tomorrow; An Educator's Blueprint. Fund for the Advancement of Education, New York, 1957.

18. ZORBAUGH, H.: Television - Technological Revolution in Education? Journal of the Society of Motion Picture and Television Engineers, Vol. 66, No. 11, 671-676, November 1957.