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Guidelines for Conducting a
Training Effectiveness Evaluation (TEE)

Volume III: User's Guide for
Revising Training Program Deficiencies

ARI Field Unit at Fort Bliss, Texas
Systems Research Laboratory

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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

    This handbook addresses the correction of product and process deficiencies which are discovered as a result of a Training Effectiveness Evaluation (TEE). The major sources of reference are the Harless Guidelines (Kristiansen, 1981) and the Methodology for Correcting Deficiencies in Training Programs (Seville Project Report 80-08).

    The purpose of this report is to provide TEE Analysts with guidelines for suggesting detailed solutions for modifying training programs, to increase training efficiency and effectiveness. For ease of use, the   (continued)

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20. (Continued)

solutions have been categorized into four global functional aspects of the training program: (1) training environment; (2) presentation; (3) practice/ demonstration; and (4) testing.

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Guidelines for Conducting a
Training Effectiveness Evaluation (TEE)
Volume III: User's Guide for
Revising Training Program Deficiencies

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Human Factors in Training and
Operational Effectiveness

The Guidelines for Conducting a Training Effectiveness Evaluation (TEE), Volumes 1-3 were developed in response to Army Training Study HRN 79-269, entitled Methodology for Training Effectiveness Analysis (TEA).

The three volumes of the Guidelines explain how to use the TEE methodology to evaluate a course of instruction and to formulate revisions for correcting training deficiencies, in ongoing courses and in training for operational tests (OT's) of new or improved equipment. Both product analyses of training materials and process analyses of training methods are covered by the Guidelines. Volumes I and III are directed toward the TEE analyst and associate analysts and explain how to conduct a TEE and how to remedy deficiencies, respectively. Volume II addresses the needs of the TEE data collector.

EDGAR M. JOHNSON
Technical Director

GUIDELINES FOR CONDUCTING A TRAINING EFFECTIVENESS EVALUATION
VOLUME III: USER'S GUIDE FOR REVISING TRAINING PROGRAM DEFICIENCIES

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1. INTRODUCTION

1.1 Background

The Army Research Institute Field Unit, Fort Bliss, contracted Calspan Corporation's Advanced Technology to develop a set of guidelines and data collection procedures and instruments for conducting a Training Effectiveness Evaluation (TEE) and guidelines for modifying deficient aspects of training which have been identified by the TEE.

The TEE system resulting from this effort is intended to be particularly applicable to Army Air Defense training, but should also have utility in evaluating and revising any Army training course or program.

This volume Guidelines for Conducting a Training Effectiveness Evaluation, Volume I: User's Guide for Revising Training Program Deficiencies, provides a set of job aids for modifying Army training programs which have been found to be deficient as a result of a TEE.

Earlier published parts of the TEE Ssytem include the following:

- Guidelines For Conducting a Training Effectiveness Evaluation - Volume I: TEE Evaluator's Handbook

- Guidelines For Conducting a Training Effectiveness Evaluation - Volume II: Data Collector's Manual

The scope of a TEE project includes collecting data on a training event for the purpose of identifying failures in task performance by trainees (e.g., performance discrepancies) or in the instructional system itself (training deficiencies). The TEE methodology provides a structural procedure for observing training and for assessing training packages in terms of their conformance with the Instructional Systems Development procedures. Data on both the training process, collected through actual observations of training, and on training products or materials, are included in the TEE. Greater detail about the procedures for conducting a TEE and its specific components can be found in the Guidelines for Conducting a Training Effectiveness Evaluation - Volume I: TEE Evaluator's Handbook.

1.2 Purpose and Scope

The Guidelines for Conducting a Training Effectiveness Evaluation, Volume I: User's Guide for Revising Training Program Deficiencies, addresses the correction of product and process deficiencies which are discovered as a result of a TEE. As was the case with the TEE guidelines, the breadth of the topics covered and the more specific steps recommended for training program modifciation are firmly based in the evaluation literature. The major sources of reference included Phase D of the Harless Guidelines (Kristiansen, 1981), the Methodology for Correcting

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Deficiencies in Training Programs (Seville Project Report 80-08), and other relevant published literature.

The purpose of this manual is to provide TEE analysts with guidelines for suggesting detailed solutions for modifying training programs to increase training efficiency and effectiveness, with respect to both trainee performances and the training system. For ease of use, the solutions have been categorized into four global functional aspects of the training program. These are:

1. Training environment - includes activities such as training plan implementation, motivational components, and macro aspects of training like training duration, adequacy of equipment, etc.

2. Presentation - covers topics related to the adequacy, sequence and comprehensibility of a course, including the use of media and visuals.

3. Practice/Demonstration - includes process and product discrepancies related to the learning and practice of trainees.

4. Testing - includes apsects of the testing activities such as adequacy and realism.

Within each of these four training components, specific subtopics and detailed problems are discussed.

1.3   Use of the Guidelines

The manuàl has been developed as a part of the TEE system to aid the analyst in the progression from training program evaluation to revisions of training products and processes that will increase training effectiveness. Each of the problems addressed has been cross-referenced with TEE worksheets. These worksheets point to specific discrepancies or deficiencies and thus serve as inputs for identifying potential solutions. In addition, the problems have been keyed to particular TEE questions. (For convenience these questions are reproduced in Appendix A). Since the questions are the meat of the TEE system, it is natural that the fixes recommended in these Guidelines should be directly related to them.

2. TRAINING ENVIRONMENT

2.1 TRAINING ENVIRONMENT: Training Site

THE PROBLEM. Environmental factors in the training site were such as to inhibit training effectiveness. That is, the site itself does not provide enough light, or is unbearably hot or cold. At its very worst, the training site should at least not detract from soldier learning and retention.

EVIDENCE for a deficient training site will come from the following worksheets:

C1.1 Observation of Classroom Instruction

C1.2 Observation of Demonstrations

C1.3 Observation of Isolated Practice

C1.4 Observation of a Performance Test

C1.5 Observation of a Written Test

C1.6 Observation of an Oral Test

C1.7 Observation of Integrated Practice

C1.8 Observation of Individual Study

Question 85. Is there enough space for all of the trainees?

Question 86. Is the instruction free of distractions?

Question 87. Is the lighting appropriate for the training situation?

Question 88. Is the temperature appropriate for the training situaton?

RECOMMENDATIONS for training program modification.

2.1.1 Not Enough Space for all of the Trainees (Question 85).

There just was not enough space to accommodate all the trainees. The training site should provide enough space so that each trainee can comfortably see everything that goes on. No trainee should be screened by another trainee or should have to strain to get a good view. If the training site is too small, a new site should be obtained for future training that eliminates the space problems of the current site. If a new site cannot be obtained, fewer trainees per instructor will "expand" the space available at the current site.

2.1.2 Training Site Too Noisy (Question 86).

Excessive noise was noted as a serious distraction at the training site. Motor pools are a good example of this. The argument is often advanced that, since trainees may have to perform on the job in a noisy environment, they should learn in a noisy environment. This is not true. Trainees should learn

to perform tasks in sites that are as free of distractions as possible. After task proficiency is gained, they can practice in a noisy environment. The training site should be selected so as to enhance training. Noisy environments hinder effective training. If trainees cannot readily hear the instruction, effectiveness (in terms of trainee performance) and efficiency (in terms of time to proficiency) both suffer. If the training site is just too noisy, a new site should be obtained for future training that eliminates the noise problems of the current site.

2.1.3 Not Enough Light at the Training Site (Question 87).

The training site was so dark that the trainees had difficulty seeing what was going on. Each trainee should be able to see clearly everything that goes on in training. The argument is often advanced that, since trainees may have to perform on the job under conditions of reduced visibility, they should learn under conditions of reduced visibility. This is not true. Trainees should learn to perform tasks in sites that are as free of distractions as possible. After task proficiency is gained, then they can practice unde conditions of reduced visibility. If the training site is too dark, a new site should be obtained for future training that eliminates the lighting problems of the current site, or, if possible, the lighting in the current site should be enhanced.

2.1.4 Temperature Inappropriate for the Training Situation (Question 88).

The trainees were so warm that they had trouble concentrating on the instruction, or so cold that they were more interested in keeping warm than in paying attention to the instructor. The training environment should aid learning and retention. The training manager should take whatever steps are necessary to secure a favorable training environment where temperature is not extreme. When an unfavorable training environment must be used, anticipate learning and retention problems and take steps, in advance, to offset the effects of the environment. Such steps may include shorter training sessions with more breaks in cases of excessive temperature.

Bad weather may also have affected the conduct of training. Training must adjust to inclement weather. If the weather is bad enough to affect training, training should be postponed or moved to a sheltered site. Since this is seldom feasible, a more realistic solution is to modify the training process to offset, as much as possible, the effects of the weather on training. The problem, of course, is that when trainees are uncomfortable, they attend more to their comfort than the training. Do not confuse training with the practice of tasks already learned. Once tasks are learned, they can be practiced in bad weather. Training time during bad weather should be lengthened, not shortened. The amount of time any trainee is exposed to the weather should be shortened. Sheltered sites should be set up for concurrent training and should be manned by instructors. With such an arrangement, students can be trained during several short sessions in the weather and can practice associated tasks in the sheltered site. Both trainees and instructors can be shuttled back and forth. If none of these solutions are feasible, remedial training needs to be scheduled.

2.2 TRAINING ENVIRONMENT: Implementation of Training Plan

THE PROBLEM. The training that was actually conducted was not a faithful implementation of the training plan (lesson plan or instructor guide). The lesson plan should lay out the training activities to be completed in enough detail for any instructor-trained subject matter expert to follow. The instructor should follow this prescription for training this task.

EVIDENCE for an unsound implementation of the training plan will come from the following worksheets:

> C1.1 Observation of Classroom Instruction
>
> C1.2 Observation of Demonstrations
>
> C1.3 Observation of Isolated Practice
>
> C1.7 Observation of Integrated Practice
>
> Question 82. Does the instructor follow the methods in the Instructor Guide?
>
> Question 83. Does the instructor teach all of the content in the LESSON materials?
>
> Question 84. Did the instructor limit his teaching to the content in the LESSON materials?

RECOMMENDATIONS for training program modification.

2.2.1 Instructor Did Not Follow the Instructor Guide (Question 82).

The instructor did not follow the training activities in the lesson plan or Instructor Guide. It is assumed that the Instructor Guide provides a good training presentation as defined in Section 3 of this User's Guide.

If it does not, then the Instructor Guide itself needs to be rewritten. The instructor should follow the Instructor Guide. If he or she feels that the Instructor Guide is inaccurate or does not provide good training, then he or she should take steps to have it modified. The solution to an inaccurate Instructor Guide is not just to stop following it. If the instructor has difficulty following the Instructor Guide because he or she has not been "trained to train," instructor training should be immediately scheduled.

If the audiovisual materials, charts, mock-ups, handouts, manuals, or other training aids or equipment called for in the Instructor Guide were not used, find out if they were available. These materials should be collected and checked out by the instructor 24 hours in advance. If they are not available to the instructor, and will not be available in the future, the Instructor Guide should be revised. Any materials that are inaccurate should be eliminated from the Instructor Guide or revised.

2.2.2 The Instructor Did Not Follow the Content Guidelines From the Lesson Plan (Questions 83 and 84).

Trainees cannot learn everything that is presented to them during a course of instruction, so they need help in determining what is important and what is not important. Not all statements made by an instructor are equally important. Some subtasks or steps are more critical than others. Instructors should highlight critical subtasks and steps for the trainees by (1) emphasizing the "need to know" and minimizing the "nice to know;" (2) minimizing extra material that the instructor may think is helpful but which is actually not a part of the lesson; and (3) refraining from telling ancedotes not directly related to the subtask or task being learned. Instructors should have been cautioned about this during the Instructor Training Course. This point needs to be repeated often and instructors should be observed periodically, however, because projecting one's own sense of what is important and using the podium to establish credentials as an "expert" are normal. Instructors will engage in these activities without being aware of it. Even very highly trained instructors need to be cautioned occasionally about this. Beware of the argument that "stories" motivate trainees and relax the training atmosphere. They may and they may not. In any event, story telling should be confined to breaks.

The argument that instruction was added or deleted to conform to current reality should be pursued with the instructor. Sometimes equipment or doctrine changes, new or changed publications (TMs, FMs, etc.), new training guidance, etc., will have forced a modification to the lesson plan that, because of time constraints, has not been made. Instructors may be aware of these changes and may have already changed the actual instruction. If this has happened, press the training developer to make the changes on the lesson plan as soon as possible.

It may also be the case that the instructor did not reach all of the content in the lesson materials because there was not enough time in the schedule to cover all the material in the lesson plan. The time scheduled for a lesson should allow an introdution, lecture(s), demonstration(s), and enough practice trials to bring almost all (at least 90%) trainees to standard on all subtasks and tasks. This should all be accomplished at a pace that the trainees can maintain. If there are no obvious inefficiencies, enough time should be allotted for these training events. If these training events do occur, but training time is not efficiently utilized, these inefficiencies should be solved before addressing the time problem.

2.3 TRAINING ENVIRONMENT: Number of Instructors

THE PROBLEM. Instructional personnel were not present in sufficient numbers to ensure that all students can see, hear, and receive feedback. For example, the presentation of STATEMENTS and EXAMPLES requires every student to see and hear what is being presented. For PRACTICE events, there should be sufficient instructors or assistant instructors to provide necessary FEEDBACK and FEEDBACK HELP to every student.

EVIDENCE for an insufficient number of instructors will come from the Worksheets C1.1 Observation of Classroom Instruction and C1.3 Observation of Isolated Practice

> Question 81. Is the instructor/trainee ratio such that all students can see, hear, and receive FEEDBACK?

RECOMMENDATIONS for training program modification.

2.3.1 Not Enough Instructors Present for Training (Question 81).

There were not enough instructors available to insure that all students can see, hear, and receive feedback. Enough instructors/assistant instructors must be assigned to training so that the training can be carried out as planned. This must include a sufficient number of assistant instructors to provide the necessary one-on-one guidance during practice activities.

Errors made during practice become learned as part of the skill if not immediately corrected. They then have to be "trained-out" at some future training event. Assistant instructors must be on-hand to insure that every trainee practices the task until he reaches the training standard, correcting errors in performance as they are made. Errors pointed out during critiques following task performance will not correct faulty performance unless immediately followed by additional practice events and the process repeated until error-free performance is realized. This is inefficient — it is far better to correct errors in performance as they occur. If providing assistant instructors in the required numbers is not feasible, then training sessions should be lengthened so that each trainee still receives the one-on-one training during practice activities. Instead of two instructors training four trainees in 60 minutes (30 minutes per trainee), for example, one instructor may train four trainees in 120 minutes (30 minutes per trainee). In this way each trainee still receives the required supervised practice. If time and number of instructors cannot be changed, then training objectives must be modified to reflect what can be trained with the given resources.

2.4   TRAINING ENVIRONMENT: Training Duration

THE PROBLEM. The time devoted to this training was either so short that the instruction was rushed or that some events were left out, or so long that trainees got bored.   Either extreme is bad, with short time allotments harder to compensate for.

EVIDENCE for too much or too little training time will come from the following worksheets:

C1.1   Observation of Classroom Instruction

C1.2   Observation of Demonstrations

C1.3   Observation of Isolated Practice

C1.4   Observation of a Performance Test

C1.5   Observation of Written Test

C1.6   Observation of an Oral Test

C1.7   Observation of Integrated Practice

C1.8   Observation of Individual Study

Question 90. Are frequent breaks provided?

Question 92. Was the allotted training time too long or too short?

RECOMMENDATIONS for training program modification.

2.4.1   Insufficient Breaks or Rest Periods (Question 90).

Breaks were not provided or, if they were, they were too short or infrequent. Rest periods of at least 5 to 10 minutes should be allowed after each hour of instruction.   Longer breaks should be given if the instruction exceeds 3 or 4 hours.   Insufficient rest periods will result in trainee fatigue, lack of attention, and decreased performance.   If the time allotted in the training schedule does not allow for sufficient breaks, the syllabus should be adjusted accordingly (see recommendations for Question 92 below).

2.4.2   Allotted Time Too Short/Long (Question 92).

The time allotted in the lesson plan (or Program of Instruction or Training Schedule) was too short/long for the successful accomplishment of the training objectives.   Training time here has to be considered along with training equipment and assistant instructors.   The lesson plan (or Program of Instruction or Training Schedule) should specify enough training equipment and assistant instructors to permit each trainee to practice the task until he or she gets it right under the time standard specified for the task.   The problem is one of planning.   You will have to find out how many training sites are

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scheduled, how many trainees are in a usual sized class, how much classroom (general) instruction time is provided, how much time of instruction is planned for each individual trainee, and the time standard for the task. From this, you can determine minimum allotted time. An example follows.

If there are to be 10 sites (each manned by an assistant instructor; do not count any site that is not so manned) with five trainees at each site (i.e., 50 trainees for 10 sites is five trainees per site), 30 minutes of general instruction, 10 minutes of individual instruction for each trainee, where each trainee is required to walk through the task one time and then practice until he or she can perform it one time to standard, and the time standard for the task is 10 minutes, then the total time that must be allocated is:

General instruction   =   30 minutes

plus

five trainees (per site) X 10 minutes   =   50 minutes
(individual instruction)

plus

two repetitions (at least) of the   =   100 minutes
task X 10 minutes (standard) X
five trainees (per site)
_____
180 minutes

If the trainees are to be given a 10-minute break every hour, then an additional 20 minutes will be needed for two 10-minute breaks. Note that the nearly three and one-half hours does not allow time for anyone to get the task wrong during practice and does not allow any buffer time for contingencies, and therefore is the very minimum on this example. Do the arithmetic for the task to determine the minimum time allotment. If you cannot get the figures you need for input, then training has not been carefully planned. This problem should be brought to the attention of the training developer so that time allocations can be made. If you do the arithmetic and come up with the allotted time being too short or too long, notify the training developer so that the appropriate adjustments can be made. Do not shy away from this because it looks complicated. Insufficient time is a typical training problem that will occur again and again. If you do not correct it, probably no one will.

2.5   TRAINING ENVIRONMENT: Attitudes and Motivation

__THE PROBLEM.__   Trainees did not appear interested and did not actively participate in the instruction, or they indicated that they didn't care about the training or didn't want to learn.   They may even have displayed hostility or frustration during instruction.

__EVIDENCE__ for poor trainee attitudes will come from the following worksheets:

> C1.1   Observation of Classroom Instruction
>
> C1.2   Observation of Demonstrations
>
> C1.3   Observation of Isolated Practice
>
> C1.8   Observation of Individual Study
>
> C1.10 Trainee Reaction Questionnaire
>
> Question 28. Is the trainee attitude positive?

__RECOMMENDATIONS__ for training program modification.

2.5.1   Poor Trainee Attitude (Question 28).

Trainees generally prefer to be passive learners.   In many ways this is reasonable given the world of television, the passive nature of public instruction today, and the use of so many films and slide presentations during military training.   Training, however, cannot be a passive enterprise for the trainee.   Skills are developed through active participation.   Instructors should build an atmosphere that encourages participation by being candid, friendly, non-critical, and eager to help trainees learn and master tasks.   All criticism should be positive and aimed at task performance rather than negative or aimed at the trainees.   It is the task performance that is substandard, not the trainee.   The instructor should also make a concerted effort to motivate the trainees.   Ways of motivating students are discussed in the recommendations for Question 27 in the section "GENERAL OBSERVATIONS: Instructor Performance."

There are a number of other causes for poor trainee attitude.   These will be identified by other TEE questions.   Some examples are malfunctioning training equipment (Question 93), uncomfortable training site (Questions 85-88), material too difficult for student reading level (Question 71), trick test questions (Question 16), and so forth.   When the recommendations for solving each of these training problems are implemented, trainee attitude should improve.

THE PROBLEM. Instructors did not demonstrate a good grasp of how to conduct effective training. Since the instructor is usually the medium through which the information and guidance flows to the trainee, attention is rooted on the instructor. Flaws in presentation technique stand out and can destroy the positive training benefits of well designed training. All instructors should have attended an Instructor Training Course. Any who have not should be scheduled to attend such a course as soon as possible. Subject matter expertise will not compensate for a lack of skill in training delivery.

EVIDENCE for substandard instructor performance will come from the following worksheets:

      C1.1   Observation of Classroom Instruction

      C1.2   Observation of Demonstrations

      C1.3   Observation of Isolated Practice

      C1.4   Observation of a Performance Test

      C1.5   Observation of a Written Test

      C1.6   Observation of an Oral Test

      C1.7   Observation of Integrated Practice

      Question 27. Are attention-getting/motivational techniques employed?

      Question 89. Is the instructor's attitude positive?

RECOMMENDATIONS for training program modification.

2.5.2 Attention Getting or Motivational Techniques Not Employed (Question 27)

No attempt was made to motivate the trainees. Trainee motivation must be a central consideration during the design of any training program if it is to be successful. Training that does not capture the enthusiasm of the student will be less than optimally effective. Some ways to motivate students are to tell them why the training is necessary, how the task fits in with their eventual job duties, and what would happen to them if they did or did not learn the task.

The purpose for the training should be given to the soldiers. The training objective tells the trainee what he or she will be learning to do. The

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purpose tells the trainee why he or she has to learn it and why it must be learned now. Most training developers use this opportunity to motivate the trainees. For example, if the training objective is to learn to fix "X," the purpose will tell them why they (instead of others) have to learn to fix "X" and why they have to learn to fix it now instead of some other time. Such trainee put-offs as, "You need it to pass the test," or "You need it to get the MOS," or "You need it on the job" should be avoided. If there is a good reason for giving the training in the course, then the reason should be given to the trainees. If there is no good reason, then perhaps the training should not be given in the course.

The trainees should also be told how each unit of training fits in with eventual job duties. Tying training to eventual job duties helps soldiers develop a feel for the whole job, giving them a framework for hooking the various tasks together in a sensible fashion.

Finally, trainees should be told what would happen to them if they did or did not learn to perform the required tasks. If there are no rewards for learning the required tasks, and/or there are no penalties for not learning them, it will be very hard to motivate the trainees. In essence, it will make no difference to them if they learn or not. Consequences for learning/not learning may be at the course level rather than the task level but there should be consequences. All rewards and penalties should be made known to the trainees.

2.5.3 Negative Instructor Attitude (Question 89).

Instructors should exhibit a positive attitude at all times toward the training, themselves, and the trainees. Instructors should not use the podium to launch their personal beliefs about the state of the Army, the quality of today's soldiers, pay and allowances, readiness, combat capabilities of units and items of equipment, instructional objectives/sequence/organization, training materials, job aids, or anything else. The instructor is the model that the trainees are expected to follow. This model should be positive. Instructors who do not display a positive attitude should be cautioned about this by the training manager. Continued demonstration of a poor attitude by an instructor, no matter how friendly, entertaining, or technically proficient, should be cause for seriously considering his removal from instructor duties.

2.6   TRAINING ENVIRONMENT: Training Equipment

THE PROBLEM.   Training devices (including actual equipment used during the training) did not work properly, resulting in degradation of the learning process.

C1.1   Observation of Classroom Instruction

C1.3   Observation of Isolated Practice

C1.6   Observation of an Oral Test

C1.8   Observation of Individual Study

Question 93. Does the training device/equipment used in training function properly?

RECOMMENDATIONS for training program modificaton.

2.6.1   Non-Functioning or Malfunctioning Training Equipment (Question 93).

The training equipment did not work properly. It is almost impossible to train students to standard using equipment and materials that do not work properly. For example, in a task involving meter calibration, if the equipment is not operating as it should, students will not be able to see the task demonstrated properly or practice the task under normal conditions. In adddition, malfunctioning training equipment undermines trainee confidence in the actual equipment, and causes students to question the competence of the instructors. Training equipment should be secured by the instructors well in advance of the training and checked to insure that it works properly.

2.7 TRAINING ENVIRONMENT: Distractions

THE PROBLEM. The training was interrupted, or the trainees were distracted from training, by such things as equipment failure, instructor absence, VIP orientations, high ranking observers at the training site, administrative requirements, etc. This may look like a non-training problem but the effects of such interruptions are on trainee skill and knowledge. Test data will indicate where trainee performance deficiencies are. Remedial training may need to be scheduled to bring trainee performance levels up to standard.

EVIDENCE for the presence of distractions during training will come from the following worksheets:

C1.1　Observation of Classroom Instruction

C1.2　Observation of Demonstrations

C1.3　Observation of Isolated Practice

C1.4　Observation of a Performance Test

C1.5　Observation of a Written Test

C1.6　Observation of an Oral Test

C1.7　Observation of Integrated Practice

C1.8　Observation of Individual Study

Question 86. Is the instruction free of distractions?

RECOMMENDATIONS for training program modification.

The training session was seriously distracted at one or more points by such things as interrupted training (VIP coming into teaching area, training movement for administrative purposes, power failure, training aid malfunction, etc.), excessive noise over which the instructor has no control, sudden instructor or trainee illness, etc., and/or factors in the training environment were severe enough to have adversely affected trainee attention and learning. The specific problem in this case will be supplied by the analyst. There is very little that can be done to prevent training distractions. When they occur, however, soldier learning usually suffers. The problem in this case is what to do about that. Test data will indicate where soldier performance deficiencies are. Remedial training will need to be scheduled to bring soldier performance levels up to standard.

There are two special cases of training distractions which merit specal attention:

2.7.1　Observers Distracting.

Observers at the training site distracted the soldiers from training. The instructional staff usually has little control over the number, rank, and

activities of observers. If the observers were so distracting that they actually interrupted training, a remedial training session may have to be scheduled. If they were just bothersome, steps may need to be taken to actively close the training site to anyone who does not belong there. Many times observers are just "official looking," and actually have no real business in the training site.

2.7.2 Training Interrupted.

Training was interrupted or stopped for some reason. You may have to question the training observer, soldiers, and/or instructors to find out what happened. If the interruption was serious, remedial training may have to be scheduled. Serious interruptions are those that result in subtasks or tasks not being completely covered or practiced to standard by everyone. Acts of God and higher headquarters cannot be put off. Nuisance interruptions, however, can often be controlled with proper planning.

3. PRESENTATION

3.1 PRESENTATION: Prerequisites

THE PROBLEM. The instructor did not review course entry skills or he neglected to verify mastery of prerequisite skills prior to new instruction.

EVIDENCE for inadequate assessment of prerequisite skills and knowledge will come from the following worksheets:

C1.1 Observation of Classroom Instruction

C1.2 Observation of Demonstrations

C1.3 Observation of Isolated Practice

C1.7 Observation of Integrated Practice

Question 29. Are course ENTRY SKILLS reviewed?

Question 30. Is mastery of prerequisite skills verified prior to new instruction?

RECOMMENDATIONS for training program modification.

3.1.1 Prerequisite Knowledge Not Assessed (Questions 29 and 30).

The instructor did not question the trainees about what they were already supposed to know. Sometimes (but rarely) this is not necessary because the trainees have been pretested on baseline knowledge and skills and the results provided to the instructor. If the trainees have not been pretested, however, the instructor should ask enough questions to ascertain that the trainees do indeed know what the lesson assumes they know. If they do not, remedial training is needed before task training begins. If this group of soldiers is typical of future input, training has to be modified to include this additional training.

3.2 PRESENTATION: Training Objectives

THE PROBLEM. Trainees were not mentally prepared to receive the training because training objectives were not presented first. This should be required by the lesson plan and should occur at the start of each lesson.

EVIDENCE for the fact that the training objectives were not clearly communicated to the trainees will come from the following worksheets:

C1.1　Observation of Classroom Instruction

C1.2　Observation of Demonstrations

C1.3　Observation of Isolated Practice

C1.7　Observation of Integrated Practice

Question 31. Are OBJECTIVES presented to the student?

RECOMMENDATIONS for training program modification.

3.2.1　Training Objectives Not Presented to Students (Question 31).

The trainees were not given the training objectives in a clear and easily understandable format. All training objectives have three parts that must be given to the trainee: (1) the task statement that tells the trainees what they must be able to do following training; (2) the conditions statement that tells them what they will have to do it with and the conditions under which they will have to perform; and (3) the standard that tells the trainees how accurately and/or quickly they will have to do it to get a GO. All three parts must be in the lesson plan and all three parts must be given to the trainees at the beginning of training.

3.3 PRESENTATION: Course Administration Directions

THE PROBLEM. Course administration directions, contained in the lesson plans, are incomplete or make unrealistic demands of students and instructors. If the lesson plans do not completely outline how the course and individual lessons are to be administered, then there is no guarantee that the training program will achieve the training objectives. Inadequate or unrealistic course administration directions will cause instructors to abandon the lesson plan and give instructor-specific training.

EVIDENCE for inadequate course administration directions will come from the following worksheets:

C1.1   Observation of Classroom Instruction

C1.2   Observation of Demonstrations

C1.3   Observation of Isolated Practice

C1.7   Observation of Integrated Practice

C1.8   Observation of Individual Study

Question 79. Are course administration directions complete?

Question 80. Do course administration directions make realistic demands of students and instructors?

RECOMMENDATIONS for training program modification.

3.3.1 Course Administration Directions Incomplete (Question 79).

Course administration directions were incomplete or nonexistent and instructors were left to their own judgment as to how to conduct training. A complete lesson plan should do the following:

a)   Call for the dissemination of the required enabling knowledge in either a lecture or a hand-out.

b)   Call for a demonstration of the task (in its entirety).

c)   Require demonstrations for each subtask in the lesson and on integrated demonstration after subtask training.

d)   Call for supervised hands-on practice.

e)   Require that each subtask and task be practiced.

f)   Specify that practice on each subtask/task will be performed by each trainee to a specified standard (or to the standard specified in the training objective).

g) Provide guidance for assistant instructors (AIs) by informing them what to look for during practice and how to correct faulty performance.

Each of these features is described in detail below:

a) <u>Does the lesson plan call for the dissemination of the required enabling knowledge in either a lecture or a hand-out?</u>

Terms, concepts, or other subject matter that are included in a lesson to enhance the trainee's understanding of the tasks to be learned is referred to as "enabling knowledge." The lesson plan should specify the enabling knowledge needed by the trainees for task performance. It should specify, as a first event in any sequence of training events, a discussion or lecture where the instructor establishes the terms and concepts needed by him or her and the trainees to talk about the task.

The lesson plan should specify what enabling knowledge is to be presented and prescribe procedures (a set of rules, a formula to follow, etc.) for presenting it since the trainees must readily understand the material and be able to converse easily about the task using corrective terms and concepts. The lesson plan should specify that training not progress to a practice event until the instructor is sure that the trainees understand and can use the appropriate terms and concepts.

The lesson plan should specify the required terms and concepts. These terms and concepts include such things as names or labels for things, introduction of new equipment, explanations of working relationships between parts, the establishment of required readings on gauges and dials, the introduction of rules or strategies, the explanation of underlying concepts, etc.

b) <u>Does the lesson plan call for a demonstration of the task in its entirety?</u>

The lesson plan should call for a demonstration of each task, including the appropriate steps or subtasks. The lesson plan should provide guidance to the instructor in conducting the demonstration; it should prescribe how the demonstration is to be conducted. Merely listing the task to be demonstrated, and directing the instructor to demonstrate the necessary maintenance, assembly disassembly, or operating procedures is not sufficient.

Typically the lesson plan should call for demonstrations to be conducted by the instructor on the actual equipment (or a high fidelity mock-up) in full view of the trainees being trained. This provides the trainees with a live model of the skilled performance required, and allows the trainees to stop the instructor to ask questions. Films, slides, or other pictorial methods are usually less effective methods of demonstrating tasks, and

should only be used when time and resources do not permit a live demonstration by the instructor.

In most cases the lesson plan should call for a formal demonstration rather than a walk-through or talk-through. A walk-through or talk-through may be adequate for demonstrating relatively simple tasks where skilled performance is not required, but it is a poor substitute for a formal demonstration in most applications. Extensive supervised practice following a walk-through or talkthrough can sometimes compensate for the lack of a formal demonstration, but in general the lesson plan should provide for a formal demonstration.

c)   If there are subtasks in the lesson, are demonstrations required for each subtask and is a combined demonstration required after subtask training?

A subtask is a part of a larger task that can be performed independent of the larger task. If there are subtasks in the lesson, the lesson plan should call for the subtasks to be demonstrated either as part of the overall task or as separate subtasks. When a task consists of a number of related subtasks that are part of a larger overall task, the lesson plan should call for a demonstration of each followed by a demonstration of the full task to include each of the subtasks performed sequentially. The lesson plan should specify the demonstration sequence in considerable detail and show how to schedule demonstrations and practice together.

d)   Does the lesson plan call for supervised hands-on practice?

The lesson plan should call for practice of the task where practice is defined as hands-on performance of the task, on the equipment listed in the training objective, supervised by an instructor or assistant instructor, during training. Practice events are essential to skill development. No matter how good lectures, demonstrations, "talk-throughs," or "walk-throughs" are, trainees will not learn to perform tasks unless they practice them.

e)   Does the lesson plan require that each subtask and task be practiced?

Both subtask and task practice should be specified in the lesson plan. Subtask practice is practice on a part-task, or on a step in a long sequence, or on a particular set of actions that are part of a task. Subtask practice is necessary when a task is composed of many subtasks (where the sequence of actions is too long and involved for the trainee to master in one practice session). It is more efficient to have the trainee master the sequence by groups of subtasks.

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After several subtasks have been performed to standard, then the trainees can begin to put them together. The practice event where the trainee attempts to put the subtasks together, to practice the entire task under the training condition to the training standard, is called whole-task practice.

f) <u>Does the lesson plan specify that practice on each subtask/task will be performed by each trainee to a specified standard (or to the standard specified in the training objective)?</u>

The lesson plan should require each trainee to practice each task and subtask until he or she meets the standard listed in the training objective at least once. No trainee should be allowed to progress in training without having satisfied the training objective. Novel or difficult tasks may require more than one demonstration of proficiency by each trainee.

g) <u>Does the lesson plan provide guidance for assistant instructors (AIs) that tells them what to look for during practice and how to correct faulty performance?</u>

Progress should be made during practice. As obvious as this point seems, it is often ignored. Progress is crucial, for if it does not occur, the trainee is practicing at least some incorrect performance. Furthermore, because progress should occur, failure to make progress is a good indication that something in the training needs correcting. Judgments as to whether progress is occurring must be made by AIs who are monitoring practice. This means that the lesson plan should provide guidance for the AIs that tells them what performance problems are likely, how to identify them, how to provide feedback, and what remedial exercises to use to correct faulty performance. For example, the lesson plan should specify those aspects of the tasks that are likely to cause problems for the trainees, list common trainee errors on the tasks being practiced, and direct the instructor to make feedback regarding trainee errors immediately, specific to the actions performed, and free of ridicule.

3.3.2 Course Administration Directions Unrealistic (Question 80).

Course administration directions made unrealistic demands on students or instructors. Students and instructors are, after all, only human. Course administration directions should take into account the qualifications and limitations of students and instructors and should not require them to do what is beyond their capability. The "fix" required depends upon the specific unrealistic demand. For example, an instructor cannot be in more than one place at the same time. If the course directions require one instructor to supervise hands-on practice for 30 students in a 30 minute time period, the directions are clearly unrealistic. In this case, you would recommend that a sufficient number of AIs be provided or that time allotted for practice be increased.

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3.4 PRESENTATION: Adequacy

THE PROBLEM. The basic presentation components are inadequate. Required presentation components are missing; statements for concepts, procedures, or rules are incomplete or inadequate; or statement help provides insufficient explanation. (Adequacy criteria for examples, practice and feedback can be found in the sections on Examples, Practice, and Feedback, respectively.)

EVIDENCE for inadequacy of presentation components will come from Work Sheet CI.I   Observation of Classroom Instruction.

Question 32. Are basic PRESENTATION COMPONENTS present?

Question 33. Are STATEMENTS complete?

Question 34. Are STATEMENTS for CONCEPTS, PROCEDURES, or RULES adequate?

Question 35. Does STATEMENT HELP provide sufficient explanation?

RECOMMENDATIONS for training program modification.

3.4.1 Instructional Presentation Incomplete (Question 32).

The instructional presentation lacks one or more of the required presenta.tion components. The term "instructional presentation" covers all the ways that instruction can be presented. This includes printed self-study materials, lectures, computer-assisted instruction, films or videotapes, tape-slide presentations, audio tape, videodisc, one-on-one tutorials, and any combination of these.

For a presentation to be complete, it must contain certain components, depending on the task/content level. There are four main presentation components:

STATEMENT	The student is given a statement of a fact, a concept definition, the steps of a procedure or rule, or a statement of a principle.
EXAMPLE	The student is told or shown how a statement of a concept, procedure, rule, or principle applies in a specific case.
PRACTICE REMEMBERING	The student is asked to supply part or all of a fact statement, concept definition, the steps of a procedure or rule, or a statement of a principle. The student is also given feedback about the correctness of his answer.
PRACTICE USING	The student is asked to use a concept definition, procedure, rule, or principle on a specific case to which it applies, and is given feedback about the quality of his performance.

Different combinations of these components are required, depending on the task level of the objective. Figure 1 shows which presentation components are required for each task level. In order to use Figure 1, check the presentation component used and the task level of the instructional presentation. The table will indicate whether or not the presentation component is required. There is only one problem area, the USE-UNAINED objective task level. This will require a STATEMENT and PRACTICE REMEMBERING (with feedb ck) only if the REMEMBER objective was not taught recently, or if the students do not fall into the indicated category.

3.4.2 Statements Incomplete (Question 33).

The fact, concept, procedure, rule, or principle statement was incomplete. A statement cannot be considered as present in the instruction unless it is complete. Statements should have the following parts:

o FACTS: The complete fact or set of facts should be presented.

o CONCEPTS: All critical characteristics and how they are combined should be given.

o PROCEDURES: All steps should be given in the correct order.

o RULES: All steps and branching decisions should be given in the correct order.

o PRINCIPLES: All potential component concepts, procedures, rules, and/or principles should be given (unless remembering them can be considered an entry skill) along with the principle itself (a general rule giving typically incomplete guidance on how to construct a higher order rule from the component parts).

3.4.3 Statements Inadequate (Question 34).

The concept, procedure or rule statement was not clearly stated. For difficult concept tasks, it is often desirable to include not only the concept characteristics, but also a decision strategy or rule for making classifications. For procedures, each step should have only one action. If there is more than one, the step should be broken up. Also, explicit safety precautions should be included as separate steps. For rules, if a formula is used, symbols must be defined.

3.4.4 Statement Help Provides Insufficient Explanation (Question 35).

The statement help did not aid the student in better understanding and remembering the statement. Methods of providing help include:

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PRESENTATION COMPONENT

	Statement	Practice Remembering	Feedback for Practice Remembering	Examples	Practice Using	Feedback for Practice Using
REMEMBER	required	required	required	not required	not required	required
USE-UNAIDED	required unless the associated REMEMBER objective was taught recently*			required	required	required
USE-AIDED	the aid replaces statement	not required	not required	required with aid	required with aid	required

*If these COMPONENTS are not actually present, consider them missing unless:

- They were taught within the past few days, or

- they were taught within the past few months and the training materials used are still available for students to review, or

- the students have had closely related MOS experience

Figure 1 COMPONENTS REQUIRED FOR TASK LEVELS AND CONTENT TYPES

1. Giving a mnemonic (memory trick).

2. Giving a general example of how the statement can be used.

3. Explaining why the statement is important.

4. Explaining how it came about, how it fits in the course, or how it relates to something the student already knows.

5. Explaining the terms in the statement.

6. Representing the statement with pictures, symbols, flowcharts, tables, etc.

More detailed guidelines for help for various types of content are given below.

HELP for REMEMBER-FACT objectives should:

1. Make the facts easier to learn by using one or more of these techniques:

   a. Relate the new material to previous learning.

   b. Illustrate the material in a memorable way by using graphics.

   c. Use a rhyme, acronym, chunking, or other memory aid.

2. Be clearly linked to the information to be learned.

3. Not add substantially to the memory load.

4. Include only essential information.

HELP for REMEMBER-RULE, -CONCEPT, or -PROCEDURE objectives should:

1. Make the steps, operations or critical characteristics easier to remember by using one or more of these techniques:

   a. Present a verbal memory aid, such as an acronym or jingle.

   b. Organize the steps, operations, or critical characteristics into small groups (chunks).

   c. Illustrate each step, operation, or critical characteristic in a memorable way by use of graphics.

   d. Present a memorable description or example of the steps, operations, or characteristic.

e.   Relate the new material to previous knowledge.

2.   Be clearly linked to the material to be learned.

3.   Not add substantially to the memory load.

4.   Include only essential information.

HELP for USE-CONCEPT objectives should:

1.   Make the concept easier to use by one or more of the following techniques:

     a.   Relate to what the learner already knows.

     b.   Highlight some or all of the critical characteristics of typical example(s).

     c.   Redefine or explain terms which were previously introduced.

     d.   Explain, expand, or restate critical characteristics.

     e.   Present a search strategy for recognizing examples.

2.   Relate directly to the generality.

HELP for USE-PROCEDURE objectives should:

1.   Make the procedure easier to use and overcome expected problems or common mistakes by one or more of the following techniques:

     a.   Relate all or part of the procedure to the learner's prior general knowledge or previous learning of specific steps.

     b.   Give the reasoning behind all or part of the procedure.

     c.   Explain common errors, expand, or restate each of the steps as needed.

     d.   Redefine or explain terms which were previously introduced but may need to be reviewed.

     e.   Use graphics or illustrations for emphasis or clarification.

2.   Be clearly related to the procedure statement in form and content.

HELP for USE-RULE objectives should:

1.   Make the rule easier to use and overcome expected problems or common mistakes, by doing one or more of the following:

a. Present an application of the complete rule to a given situation.

b. Relate all or part of the rule to the learner's prior general knowledge or previous learning.

c. Expand, restate, or explain difficult steps or operations in greater detail.

d. Point out and explain common errors.

e. Redefine or explain terms which were previously introduced but may need revision.

f. Give the reasoning behind all or part of the rule.

g. Use graphics or illustrations.

h. Present alternate representation of the rule.

2. Be clearly related to the generality.

3.5 PRESENTATION: Sequencing

THE PROBLEM. Training did not progress as it should have. Objectives within a lesson were not sequenced properly, or the lessons themselves were not sequenced properly within the course.

EVIDENCE for an improper training progression will come from the following worksheets:

> C1.2   Observation of Demonstrations
>
> C1.3   Observation of Isolated Practice
>
> C1.9   Rating of Process Evaluation Questions Covering a Series of Training Events
>
> Question 75. Are the OBJECTIVES (TLOs and LOs) within each LESSON sequenced properly?
>
> Question 76. Are the LESSONS sequenced properly within the course?

3.5.1 Objectives (TLOs and LOs) Within a Lesson Improperly Sequenced (Question 75).

The sequence of objectives within a lesson did not follow the natural order of learning inherent in those objectives. The purpose of proper sequencing of learning objectives is to assure that each learning objective is placed in the best relationship with other learning objectives to:

> o   prdduce the most learning in the shortest period of time
>
> o   help the trainee make the transition from one skill or body of knowledge to another
>
> o   assure that the supporting knowledge and skills are acquired before dependent subject matter is introduced.

Keep in mind that there are no hard rules for sequencing objectives. However, there are rules of thumb which will help to devise a reasonable sequence:

In order to sequence two learning objectives, you must first determine the relationship between them. Two learning objectives may have:

> 1)   a dependent relationship, in that mastery of one requires prior mastery of the other.
>
> 2)   an independent relationship, in that they are totally unrelated and independent of each other; or
>
> 3)   a supportive relationship, in that some transfer of learning takes place from one learning objective to the other.

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The table below contrasts the three types of dependent, independent and supportive relationships. The table or examples of each of these relationships and shows how the relationship affects sequencing.

Some effects of sequencing are described below:

1. **Sequencing effects are long-range.** The advantages or disadvantage of using any sequencing scheme will not likely show up immediately. Therefore, end-of-course tests should be used for evaluating effectiveness of sequencing techniques. Within-course tests of small portions of the course are not likely to reveal the true effects of sequence.

2. **Sequence is important to low-aptitude students.** Students who have a high aptitude for the subject matter will learn it in spite of sequencing. The lower aptitude of the learner for the content, the more important it becomes that some type of sequence and structure is provided.

3. **Sequence is important with unfamiliar materials.** Students who are familiar with materials will learn regardless of order of presentation. But as material becomes increasingly unfamiliar to the student, the importance of sequence increases.

4. **Sequence is important with non-redundant materials.** Some instructional materials are especially redundant, stating important points over and over again. Sequencing is not especially important with these materials, because the student can pick up the second time anything he has missed the first time.

Following are guidelines for sequencing objectives with dependent, supportive, or independent relationships, and TLOs.

Sequencing Objectives With Dependent Relationships

In order to sequence learning objectives (LOs) that support a TLO, review each LO to determine if certain skills and knowledges are prerequisites for others. Ask the question, "What other skills or knowledges must the student have in order to accomplish this task?" The answer to this question will help to identify the proper sequence for prerequisite objectives. The simpler prerequisite objectives should be sequenced before the higher-level (complex) objectives of which they are a part. For example, before a person can multiply, he must be able to add. Learning how to add is a prerequisite for multiplying, and must be taught first.

Sequencing Objectives With Supportive Relationships

1) Arrange objectives with supportive relationships as close together in the sequence as practical so that optimum transfer of learning can take place.

2) Arrange objectives close together if the conditions under which the learning objectives are carried out are identical or similar,

and if the conditions are difficult or expensive to produce at random times. For example, if several learning objectives have conditions such as "at night," "on muddy terrain," or "when flying at an altitude of 20,000 feet," you will probably wish to place the "at night" learning objectives together, the "on muddy terrain" learning objectives together, etc.

3. Arrange objectives close together if a particular piece of equipment must be available in order to accomplish a group of learning objectives, and if you are not likely to have continuous access to that equipment you will probably wish to group the learning objectives that use that particular equipment. In addition, you will want to keep the order of the group of learning objectives within the total program as flexible as possible. For example, if the learning objective is to "perform maintenance on helicopter," you will have to wait until the helicopter is available for maintenance before you can accomplish the objective.

Sequencing Objectives With Independent Relationships

Learning objectives with independent relationships may be arranged in any sequence. Any of the guidelines listed for sequencing learning with a supportive relationship may albe be used for sequencing objectives with independent relationships. However, with the latter, you need not be concerned about locating the learning objectives close together in the sequence unless condition or equipment constraints indicate otherwise.

Sequencing TLOs

The same guidance for sequencing LOs applies to the sequencing of TLOs. For example, one terminal LO might be to operate a certain piece of equipment while another terminal LO might be to instruct others in the proper operation of the equipment. Most likely a dependent relationship probably exists between these two terminal learning objectives; therefore, you would place "operate equipment" before "instruct others." The guidelines for sequencing supportive and independent TLOs are likewise the same as given for LOs.

3.5.2 Course Lessons Sequenced Improperly (Question 76).

The sequence of lessons within the course did not follow the natural order of learning inherent in those lessons. Lessons that teach tasks which are subordinate skills to tasks taught in other lessons should be taught first. In general, the principles for sequencing lessons are the same as those for sequencing objectives within a lesson. Guidelines for accomplishing the latter are contained in the recommendations for the previous question.

3.6   PRESENTATION: Clarity and Comprehensibility

THE PROBLEM. Instruction was not presented clearly. Presentation components were difficult to identify; written or spoken material was of poor technical quality; the wording was too difficult for students to understand; or the instructors speech or narration was difficult to listen to.

EVIDENCE for unclear or incomprehensible instructional presentations will come from the following worksheets:

C1.1   Observation of Classroom Instruction

C1.2   Observation of Demonstrations

C1.3   Observation of Isolated Practice

C1.7   Observation of Integrated Practice

Question 69. Are all PRESENTATION COMPONENTS separated and identified?

Question 70. Is the technical quality of written or spoken material adequate?

Question 71. Is the wording of written or spoken material easy for the students to understand?

Question 72. Is the instructor's presentation or the narration easy to listen to?

Question 91. Is the speed of presentation appropriate?

RECOMMENDATIONS for training program modification.

3.6.1   Presentation Components Not Separated or Identified (Question 69).

Statements, examples, and practice components were not separated from the rest of instruction, or identified so the student knows what they are, and can locate them. Each component must be separated from the rest of the instruction. This helps the student find the main idea. When the component is separated, the key points stand out, and are not buried in the presentations. There are several ways to accomplish this goal.

1.   Set off the component with a box.

2.   Use a different color or type face, or underline.

3.   Place on a separate page, or in a special place on the page.

4.   For audio, movies, or lectures, pause before introducing the component.

Each component must also be identified. After the component is separated, the student should be told what it is. This permits the student's attention to be focused on the key points and their application, rather than the student

trying to become generally familiar with everything in the instruction. Labels can be used to identify different components:

Definition of ...	Example	Practice
Procedure for ...	Demonstration	Test Yourself
Key Point:		

3.6.2 Technical Quality of Material Inadequate (Question 70).

The technical quality of written or spoken material was inadequate. Whether text appears in print, in some other visual medium, or is spoken in a lecture or demonstration, it should meet minimum standards of technical quality.

1. Each component should be directed at the primary audience, e.g., trainees rather than instructors or subject matter experts with considerable MOS experience.

2. The instruction should be performance oriented rather than topic oriented. All presentations should be performance oriented in two ways. First, a presentation should be directly related to what the student will do after the course, i.e., REMEMBER THE JOB. All too often, presentations take the form of "everything you wanted to know about ...", with no information about what the job is really like, or why the information is important. Instead, presentations should be written in terms of the job to be done. Orienting instruction to job performance is done differently for different presentation components. Statements give essential information, and are not job oriented by themselves. The job orientation, therefore, is given by providing additional information about the job context in which the statement will be applied. Examples and practice items are job oriented if they are taken from actual job situations.

   Second, a presentation should also orient the student to the performance expected during the instruction. This means that the student must be told what is in the instruction, how best to study it, and what the tests will be like. This is often accomplished by giving the objective(s) at the beginning of the presentation. Unfortunately, objectives are not usually written to communicate directly to the student. They can be confusing, because they contain unfamiliar words and topics, and complicated sentences. Instead, the instructional orientation should tell the student what is in the presentation, what he should do with the information (e.g., memorize it), and how he will be tested.

3. Main points should stand out. They should not get lost in detail, so that secondary points appear equal to main points. Components should not be too wordy, either because there is too much detail (more than the essentials needed to perform the job), or because the material is redundant (with information being needlessly repeated).

4. Information should be presented in an orderly manner so that it is not confusing. There should not be redundancy between paragraphs or ideas, missing information, scattered information (information about the same main point not in one place), or remote references (references to text or illustrations in other places).

5. Text should not have a run-together format. A run-together format is a solid mass of print. The reader cannot easily scan it. He cannot easily identify and lift out the separate points. The solution to a run-together format is to break the text up into visual "chunks" which group the information logically. Proper visual chunking lets the reader scan and identify the separate points easily.

Problems with text materials should be referred to the training of technical manual developers. A complete Instructor Training Course should include techniques for conducting clear and comprehensible instructional presentations.

3.6.3 Too Many Difficult Words or Long Sentences (Question 71).

The wording of written or spoken material was difficult for the student to understand. The purpose of instruction is to help the student to reach the terminal learning objective and its prerequisite learning objectives. The more effectively the instructor or text can communicate with him, the more likely he is to learn from the instruction. Therefore it is important NOT to exceed the student's reading level (or vocabulary level if instruction is lecture or audio-visual only).

Writing that is easy to read is usually easy to understand. It should use words with which the student is familiar, and put them into fairly short, uncomplicated sentences.

The following list of guidelines for lowering the reading difficulty level of instruction is divided into two sections: (1) Word Selection and (2) Sentence Structure.

WORD SELECTION

1. Use SHORT, FAMILIAR words when possible.

POOR CHOICE	BETTER CHOICE
accordingly	so
assistance	help, aid
facilitate	help, ease
utilization	use

feasible	possible
implement	carry out

Reading studies show that short, familiar words tend to communicate better.

2. Use CONCRETE, SPECIFIC words.

Poor Choice	Better Choice
aircraft	B-52
Majority of soldiers	95% of soldiers
physical needs	hunger and thirst
weapon	M-16

Abstract words mean different things to different people. Therefore, they can make the intended meaning unclear. Concrete words communicate more easily and precisely.

3. Use NON-TECHNICAL words.

Poor Choice	Better Choice
clavical	collar bone
NCOIC	non-commissioned officer in charge
terrain	ground
experimentation	test

When a technical word cannot be replaced by a non-technical word and the word is unfamiliar to the student, the technical word should be explained in a separate sentence either directly before or directly after its first appearance.

Of course, if the students have a technical background in the area, technical terms are appropriate.

In the case of military abbreviations, it is sufficient to write out the complete term followed by its abbreviation in parentheses the first time; and to use the abbreviation every time afterwards.

EXAMPLE: The non-commissioned officer in charge (NCOIC) gave the order. The NCOIC told the men to shine their boots.

4.   Use ACTIVE voice verbs.

Poor Choice: Better Choice:

The statement must be   You must update the statement
updated every three months.   every three months.

Poor Choice: Better Choice:

The truck will be driven   Specialist Jones will drive
by Specialist Jones.   the truck.

> This guideline does not mean that one must never use the
> passive voice. However, it should be avoided in instructions and
> procedures, as in the first example; otherwise, the job may not
> get done! ("Who is to update the statement," is important to
> your meaning.)

5.   Avoid changing action verbs into nouns.

Poor Choice: Better Choice:

In the Army, careful initial   If the Army selects and
selection and classification are   classifies personnel carefully,
important procedures in   it will have fewer maladjusted
eliminating maladjusted personnel.   people.

When verbs are changed into nouns it is difficult to tell "who did what
to whom."

SENTENCE STRUCTURE

1.   Use short, simple sentences.

Poor Choice: Better Choice:

In the case of the habitual   Remove the habitual offender
offender, there is nothing to   from the Service. He is not
do but remove him from the   an effective soldier.
Service; needless to say, he is
what might be termed ineffec-
tual as a soldier.

2.   Avoid strings of prepositional phrases.   Example: The hand of
      the man on the roof of the house.

3.   Shorten prepositional phrases.

Poor Choice:	Better Choice:
in a manner similar to	like; as
with reference to	about
in view of the fact	since; because
with due regard for	for
in a situation in which	when

4. Avoid wasteful words.

Poor Choice:	Better Choice:
are desirous of	want to
gained from the following source	from
It is recommended that consideration be given to ...	Consider ...
is responsible for selecting	selects
make provision for	provide
take appropriate measures	act; do
the fullest possible extent	the most
afford an opportunity	allow

3.6.4 Instructor's Presentation or Narration Difficult to Listen To (Question 72).

The verbal portion of the instruction was not easy to listen to.

For spoken material to be easy to listen to, its pace and pitch should be varied. It should not continue at the same rate or at the same pitch until it becomes monotonous. Also, repetition of short patterns of pace and/or pitch which give speech a "sing-song" effect should be avoided. In addition, speech should be understandable. It should not be too soft; speakers should not have speech impediments or heavy accents, nor should they mumble. Instruction on verbal presentation techniques are part of the Instructor Training Course that all instructors should have attended. If instructors have not attended an Instructor Training Course, they should be scheduled at the earliest possible time.

3.6.5 Instructor Presented Material Too Fast or Too Slowly (Question 91).

The instructor presented statements, examples, or help so fast that students had trouble following the presentation, or so slowly that students became bored. While a rapid presentation rate is all right for review when trainees have already mastered the material, trainees new to the task need to have the material presented slowly so they can follow along without getting lost. Clues to problems with presentation speed will come from observations made by the training observer. If instructors backtrack to repeat information just presented, they are already aware of the problem.

If, on the other hand, the instructor slows his presentation down to a "crawl" for the benefit of the poorest performer, he runs the risk of boring the rest of the trainees. This trainee boredom may carry over to the next training session. It hurts trainee motivation, a fragile commodity at best. Trainees who cannot keep up with the rest of the class should be scheduled for remediation outside of class time.

3.7   PRESENTATION: Examples

THE PROBLEM. Effective examples were not included in the instructional presentation. Examples or non-examples were inadequate or there were an insufficient number of examples, or example help was inadequate. For concept objectives, examples were not sequenced from easy to hard, or non-examples were not included. (Demonstrations, which are examples of procedures, are covered in the section on DEMONSTRATIONS).

EVIDENCE for ineffective examples will come from Worksheets C1.1 Observation of Classroom Instruction, and C1.2   Observation of Demonstrations.

Question 37. Are EXAMPLES and NON-EXAMPLES adequate?

Question 38. Is EXAMPLE help adequate?

Question 39. Are EXAMPLES sequenced from easy to hand?

Question 40. Are there enough EXAMPLES?

Question 41. Are NON-EXAMPLES included?

RECOMMENDATIONS for training program modification.

3.7.1   Examples Or Non-examples Inadequate (Question 37).

Students were not clearly told or shown how a statement of a concept, procedure, rule, or principle applies in specific cases. For concept objectives, examples should show all critical characteristics required for classification; non-examples should show the absence of critical characteristics. For procedure objectives, application of the procedure must be shown and steps must be shown in the correct order. For rule objectives, application of each step or branching decision must be shown in the correct order. For principle objectives, interpretation or prediction based on causes, effects, and relationships must be shown. Additional guidance on the design of adequate examples and non-examples follows.

3.7.2   Example Help Inadequate (Question 38).

Example help did not enhance student understanding. Help is applied in different ways for different content types. Some types of help recommended for each content type are given below:

CONCEPTS:

Highlight the critical characteristics of an example.

Explain why or why not something is classified as a member of a concept. Show the use of a checklist or heuristic to help classify.

Simplify early examples, e.g., use line-drawings instead of complicated photographs.

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PROCEDURES OR RULES:

Explain why each step is done.

Explain why each step is important.

Give additional information about how to perform the task.

Give additional information about how to know if it was performed incorrectly.

Give flowcharts, tables, etc.

PRINCIPLES:

Highlight important features.

Simplify the relevant information from the case study in which it is embedded.

Use logical representations of the IF-THEN relationships.

Give additional information about why the principle applies, or why it doesn't.

Give hints as to how to analyze problems.

3.7.3 Examples Sequenced Improperly (Question 39).

Examples for Concept objectives were not sequenced from easy to hard. Early examples should be simplified. In this way the learner will be positively motivated by success in understanding the easier examples, and at the same time be challenged by the more difficult ones. Estimates of example difficulty should be in reference to the students, not the instructor. A good way to determine example difficulty is to provide a sample of students from the target population with the definition of the concept and a list of randomly sequenced examples and non-examples. The students are then asked to classify each one. Difficulty ratings are then calculated for each example or non-example by dividing the number of correct responses by the number of students in the sample. The results of the analysis can then be ordered in terms of frequency of correct responses along a continuum. Examples which more than 70% of the students correctly identify are easy, while examples which less than 30% of the students correctly classify are considered difficult. Examples which fall in between (30-70% correctly identified) are of medium difficulty. Examples and non-examples can then be taken from this example pool and presented in order of difficulty (easy to hard).

3.7.4 Insufficient Number of Examples (Question 40).

There were not enough examples to cover the content area thoroughly. For Concepts there should be at least one example/non-example pair for each critical characteristic. For Procedures or Rules, there should be one example for each important step, and examples for all possible branches or decisions. More detailed guidance for Concept and Rule examples is provided below:

3.7.5 Examples for Concepts

In teaching a concept, the instructor (or instructional material) should:

1. Show a wide enough range of examples to prevent undergeneralization (failure to recognize an example as an example). To do this the instructor should present a number of examples that all have the critical characteristics but which vary widely on irrelevant characteristics. This shows the student that legitimate examples don't always look the same. It minimizes the student's tendency to not recognize legitimate examples because they look a little different. The instructor should also be aware that certain concepts have critical characteristics that have a permissable <u>range</u> of values (e.g., one critical characteristic of an airplane is that it has one or more engines). It is important in such cases that the example set samples this range of acceptable values.

2. Show each example paired with a corresponding, matched nonexample to prevent overgeneralization (tendency to identify instances as examples which are not). The nonexample should be identical with the example on irrelevant characteristics. However, it will be lacking one or more of the critical characteristics. Pairing focuses the student's attention on the critical characteristics. This helps minimize any tendency to identify a nonexample as a legitimate example by showing the likely nonexamples and pointing out why they are not examples.

    This table summarizes what the instructor should strive for in his series of example-nonexample pairs:

Examples for Rules

The purpose of presenting a series of examples for a rule is to show the application of the rule to a wide range of cases. By carefully choosing the examples to be presented in divergent example sequences, a very wide range of applications can be shown with very few examples. Examples are divergent or significantly different from each other to the degree that each example shows the rule being applied to a different set of data. The "data" are the pieces of information manipulated by the rule. They are the inputs which are used during the rule's operation. These data or input vary in form (or VALUE) from example to example. The instructor should select values for each type of data that students are likely to encounter, and should adequately sample the possible range of values. If the possible values form a continuum, the instructor can pick values at the beginning, middle, and end of the continuum to use in the items. Note that only the instructor or the developer of instruction can determine whether all the necessary data types and values have been sampled. This determination is based on subject matter expertise and thus cannot be made by someone who does not know the content.

Non-Examples Omitted (Question 41).

For Concept objectives, non-examples were not included in the instruction. Examples should be matched with non-examples according to the presence or absence of each critical characteristic. When teaching concepts, it is important to present a range of examples to insure complete learning of the concept. By showing paired examples and nonexamples, the instructor can help the student focus attention on the critical characteristics shown in the examples and missing in the nonexamples.

One condition must be met for an example and nonexample of a concept to be matched: the useful irrelevant characteristic values of the concept present in the example should be identical to those in the nonexample. In this way the critical characteristics not present in the nonexample are isolated in the example, and are the only things different. Considering an example should make this clear.

These are the critical characteristics of the concept SQUARE:

A square has

1.   Four equal-length sides.

2.   Four right internal angles.

Here is a MATCHED example-nonexample pair:

There are many irrelevant characteristics of geometric figures to draw from. A few of them which might be useful to show a variety of examples which the student might encounter include:

1.   Shading/coloring

2.   Size

3.   Line thickness

These two figures are identical in as many of these irrelevant characteristics as possible. Their respective sizes are about the same. Their lines are of equal thickness and they are not shaded. Therefore, the main difference between them is the absence of one critical characteristic having four right internal angles (the square has four right internal angles, the nonsquare does not).

Here are some example-nonexample pairs which are UNMATCHED:

This is a square.   This is not a square.

These figures differ in the irrelevant characteristic "shading." Therefore, they are not as well matched as they could be.   They would be better matched if the square was also shaded.

This is a square.   This is not a square.

These figures differ in the irrelevant characteristic, "size."   They would be better matched if they were more nearly the same size.

This is a square.   This is not a square.

These figures differ in the irrelevant characteristic "line thickness."   A naive learner might conclude that the important difference between a square and nonsquare has something to do with line thickness.   They should be matched for line thickness, since it is a irrelevant characteristic.

> Note: When a irrelevant characteristic is NOT identical in both the example and nonexample, the learner might mistakenly assume that the irrelevant characteristic is a critical characteristic. The purpose of matched example-nonexample pairs is to isolate critical characteristics.

Here is a properly MATCHED example-nonexample for the concept SQUARE:

This is a square.   This is not a square.

These figures are identical in irrelevant characteristics, number of sides, line thickness, and lack of shading.   Since as many irrelevent characteristics as possible are identical, the instance satisfies the criteria of a matched example-nonexample pair.

3.8   PRESENTATION: Media

THE PROBLEM. Media used in training were inappropriate for the task/content level of the objectives in the lessons or did not provide all of the necessary stimuli required by the objectives.

EVIDENCE for inappropriate or inadequate media will come from Worksheet B3   Product Evaluation - Evaluate Presentation.

> Question 77. Are the media appropriate for the objectives?

> Question 78. Can the media used provide all <u>necessary</u> stimuli required by the OBJECTIVES?

RECOMMENDATIONS for training program modification.

3.8.1   Inappropriate Media (Question 77).

Media used for a group of objectives were inappropriate for the task/content level of those objectives. The specific problem with the media used will have been indicated in the "Description Column" of Worksheet B3. These mismatch problems are listed below along with recommendations for their solution:

No real practice. The task level is Use and the consequences of error are serious (when the graduate is first required to perform the task on the job). The media used cannot provide the realism needed to practice the task adequately under these conditions. Recommend that one of the following media be used instead: (media definitions may be found in Appendix B).

- Large equipment
- Portable equipment
- Simulator

Incomplete information. The task level is Remember and the instructional setting is self-instruction. The media used would not present enough information without the aid of an instructor. Recommend that one of the following media be used instead:

- Audio
- Filmstrip
- Motion picture
- Printed text
- Slide/tape
- Training aid
- TV cassette
- Computer
- Programmed text
- Interactive TV
- Training device (supplemented with printed text)
- Portable equipment (supplemented with printed text)

No feedback. The task level is Use Mental Skills, i.e., concepts, procedures, rules or principles which are performed primarily in the student's mind. (A skill may have both mental and motor skills associated with it, but if the motor skills are so simple that anyone who knew the mental skills could perform them without training, the overall skill should be considered a mental skill). The instructional setting is self-instruction. The media used cannot provide corrective feedback without an instructor. Recommend that one of the following media be used instead:

- Computer
- Programmed text
- Training device
- Motion picture
- Slide/tape
- TV cassette
- Filmstrip
- Audio

No hands-on practice. The task level is Use Motor Skills, i.e. procedures which require the smooth timing of muscular movements. (all motor skills have a mental component, but with motor skills the physical activity must be practiced in order to achieve proficiency). The media used cannot provide the necessary motor manipulations.

If the instructional setting is self-instruction, recommend that one of the following media be used instead:

- Training device (supplemented with printed text)

- Portable equipment (supplemented with printed text)

If the setting is instructor-led instruction, one of the following media should be used along with the instructor:

- Portable equipment

- Large equipment

- Training device

- Simulator

Note that all of the media recommended for each situation are not necessarily the best media in terms of costs and practicality; however, they can provide the necessary learning characteristics for these conditions.

3.8.2 Media Lacks Required Stimuli (Question 78).

The media used did not display the specific stimuli required for students to learn the objective. The specific stimulus requirement will probably be one of the twenty media stimulus capabilities listed below.

Visual Form

1. Visual Alphanumeric - words, numbers and other symbols presented graphically.

2. Visual Pictorial, Plane - a two-dimensional image, such as representation in the form of a photograph or drawing.

3. Visual Line Construction Plane - a two-dimensional figure made of lines, such as a mathematical curve or graph.

4. Visual Object, Solid - a three-dimensional image or reality that is viewed from exterior perspectives.

5. Visual Environment - A three-dimensional image or reality that is viewed from inside.

Visual Movement

6. Visual Still - a static visual field, such as a photograph, drawing, or printed page.

7. Visual Limited Movement - a basically static visual field with elements that can be made to move, such as an animated transparency or simple panel with switches that move.

8. Visual Full Movement - a visual field in which all elements can move, such as a motion picture, flight simulator, or operational aircraft.

9. Visual Cyclic Movement - a visual field which moves through a fixed sequence and then repeats the sequence in a repetitive manner, such as a film loop.

Visual Spectrum

10. Black and White - a visual field composed of black and white elements, such as the printed page or line drawings.

11. Gray Scale - a visual field composed of black, white and continuous gradations of gray, such as a black and white photograph or television picture.

12. Color - a visual field composed of various segments of the visual spectrum, such as color television or motion pictures.

Scale

13. **Exact Scale** - actual visual field or a one-to-one replication of a field such as a full-sized mock-up, simulator, or operational system.

14. **Proportional Scale** - a representation of reality in other than full scale, such as a scaled model map or photograph.

Audio

15. **Voice Sound Range** - a limited quality of sound which enables spoken words to be used as the medium of communication, but not suited to more demanding tasks, such as music or sound recognition exercises.

16. **Full Sound Range** - a quality of sound reproduction that contains all the significant elements of the sound and is suited to the demanding task of sound recognition exercises.

17. **Ambient Sounds** - a complex sound environment with sound from various sources and from various directions, including background noise and task significant sounds.

Other

18. **Tactile Cues** - signals received through the sense of touch, including sensations related to texture, size or shape.

19. **Internal Stimulus Motion Cues** - the sensations felt by a person when he moves his arm, leg, fingers, etc.

20. **External Stimulus Motion Cues** - the sensations felt by a person when moved by some outside force in such a way that his body experiences roll, pitch, yaw, heave, sway and/or surge.

If the media employed does not have the required stimulus capability, recommend that the objective be taught in another medium which can accommodate the requirement. For example, suppose the objective involves giving oral orders in a combat situation. This objective would have requirements for voice sound range and ambient sounds, among others. Use of a job performance aid or typical classroom instruction would not meet these requirements. In this case, you would recommend that the objective be taught instead in a simulator or using operational equipment in a realistic environment.

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3.9   PRESENTATION: Visuals

THE PROBLEM. Visuals were not easily understood by the trainees, or were not used effectively or at all during the instruction. Visuals should enhance instruction. If they do not, either the visuals themselves or the instructions for their use should be changed. Note that the focus here is on visuals used as training aids, not job performance aids. Job performance aids are covered under DEMONSTRATION/PRACTICE, Questions 36, 51, and 52).

EVIDENCE for the ineffective use of visuals will come from Worksheets C1.1 Observation of Classroom Instruction, and C1.2 Observation of Demonstrations.

> Question 73. Is the instructor's presentation or the narration supported by visuals?

> Question 74. Are visuals easily understood?

RECOMMENDATIONS for training program modification.

3.9.1   Verbal Presentations Not Supported by Visuals (Question 73).

In order to maintain attention and interest and to aid students in understanding the material, verbal presentations should be accompanied by visuals. Visuals can be used as a HELP for a statement, an example, or feedback. Guidelines for visual HELP for various types of content are given below.

3.9.2   Visuals as HELP for Fact Objectives

Visuals can be used to explain information which was initially presented in written form. For example, if learners are asked to memorize the locations of all the fire extinguishers in a building, a drawing pinpointing all their locations could be very helpful.

Visuals as HELP for Memory-Level Objectives (i.e., Remember Concept, Procedure or Rule)

Associating something to be remembered with a vivid, visual image is often effective. In such cases the visual should be as unambiguous as possible. This means that the visuals used should be concrete rather than symbolic in nature and that each should illustrate some particularly distinctive feature of the step or characteristic to be memorized. This technique is particularly useful if the content (the rule, concept, or procedure being taught) is inherently visual in some respects. For instance, it would be easy to illustrate the characteristics of a bicycle (two wheels, pedal powered) because you can see wheels and pedals. These characteristics are concrete. However, it would be harder to graphically depict the characteristics (i.e., lyric nature, interrelationship of parts) of a sonnet. These characteristics are abstract and any visual developed would be symbolic in nature. Symbolic visuals are often misinterpreted and, therefore, are less useful as memory aids.

With concepts, this visual help is very similar to the technique used with USE/CONCEPT objectives of showing an example with characteristics

isolated. However, when selecting an example for a REMEMBER-CONCEPT objective, select an example which is most likely to be familiar to the audience, one with the least number or least confusing values for irrelevant characteristics and with easily identified critical characteristics. For instance, if teaching a REMEMBER-CONCEPT lesson about bicycles, you would seLect a standard street bike with no streamers, no hand brakes, a regular seat. When designing a REMEMBER-CONCEPT SEGMENT, you want to avoid confusing the learner with irrelevant characteristics. When designing USE-CONCEPT instruction, you may deliberately introduce irrelevant characteristics which are confusing, to help learners avoid common errors.

Visuals as HELP for Use-Procedure Objectives

Visuals or illustrations may be used to highlight aspects of procedure steps which need to be shown visually. Graphic techniques such as the use of arrows, exploded sections, or inserts or illustrations may clarify confusing or difficult steps.

For example, a step in the procedure of preparing a 35-mm camera to take pictures might be to "set the ASA/DIN to match film speed." In addition to defining "ASA/DIN" and film speed, you might also want to show a diagram of a typical camera with the mechanism for setting the ASA/DIN clearly shown.

Visuals as HELP for Use-Rule Objectives

Graphics techniques such as arrows may be used for pointing out particular aspects of rule applications to whole or partial examples.

For instance, one step in the rule for calculating the molecular weight of a compound requires counting the number of atoms of each element in the compound. The help for that step might show the following examples, using arrows for illustration.

Visuals Hard to Understand (Question 74).

Trainee questions and comments indicate that they found the visuals hard to understand. Such difficulty can arise when the visual conflicts with something the trainee is used to or has seen before, when the visual does not fit in well with the instructional sequences or when it is poorly designed. The overriding rule here is that a visual has only one real purpose, to aid student learning. If it does not, the visual and/or instruction need to be redesigned. It is not the purpose of this paragraph to detail how to design effective visuals. Problems alluded to here should be described to training development and/or graphics personnel.

3.10 Presentation: Open-ended Probe Item

THE PROBLEM. Any comment on training may be aired here, involving training environment, presentation, or practice/demonstration. The TEE evaluator will have to determine where such comments fit, and how best to use them. In this type of question, respondents tend to be bound by memory; the first, last, and most unusual situations tend to stand out. One way to use this item would be to content analyze the responses by grouping them into topics areas. If one topic has many responses, the evaluator could check to see if the data support any statements made by the students. The rating on this item is not as valuable as the information. Remember that the responses are subjective.

4.   PRACTICE/DEMONSTRATION

4.1   PRACTICE/DEMONSTRATION: Practice (General)

THE PROBLEM. Practice, defined as hands-on performance of the task, supervised by an instructor or assistant instructor, during training, either did not happen or did not happen as it should have. Practice events are essential to skill development. No matter how good lectures, demonstrations, "talk-throughs," or "walk-throughs" are, trainees will not learn to perform tasks unless they practice them. It is essential that during the practice event, every trainee practice each and every subtask and task, until performance to the training standard under the training conditions is reached. Performance to standard must be demonstrated by the soldier at least once without assistance.

EVIDENCE for missing or poor practice events will come from Worksheets C1.3   Observation of Isolated Practice, and C1.7   Observation of Integrated Practice.

> Question 58. Is FINAL PRACTICE free of external cues or help?
>
> Question 59. Are there PRACTICE items for each TLO or all of its critical parts/LOs?
>
> Question 60. Is there a PRACTICE item for each critical part of each LO?
>
> Question 61. Do all students PRACTICE?
>
> Question 62. Do all students meet the required STANDARDS in FINAL PRACTICE?.

RECOMMENDATIONS for training program modification.

4.1.1   Trainees Helped During Final Practice (Question 58).

It is entirely appropriate for trainees to get help during early practice. Instructors or assistant instructors should be available to provide demonstrations when necessary, point out cues and critical discriminations, and provide feedback. Final practice, however, should not contain anything that will not appear on the test or on the job. Instructors, evaluators, observers, and other students should not provide assistance that will not be present in the "real world." Extra hints given during final practice will cause more students to fail the test (once they don't have the assistance to rely on when taking the test). In addition to obvious help during hands-on practice, such as the instructor doing any part of the task that the trainee is supposed to perform, or offering hints or suggestions, there are also more subtle prompts, such as clearing the throat, looking up to "heaven," muttering under the breath, etc., when trainees start an action.

4.1.2 Practice for Some TLOs or LOs Missing (Question 59).

There were no practice items for a TLO or for some of its critical parts/LOs. Critical parts/LOs have the following characteristics:

o   They are some of the most measurable and observable elements of the task.

o   They have serious consequences of inadequate performance in terms of their impact on task performance.

o   They are common sources of failure.

They are actions which the soldiers of the target population do not already know how to do and must therefore be taught.

Task proficiency is usually built, like a house of blocks, by fitting one subtask (block) to another until the whole is completed. Trainees should be required to demonstrate proficiency (through practice) on meaningful parts of a task (subtasks) before progressing in training to whole-task practice. If they are not proficient on the part-tasks, they will have a lot of trouble putting it all together. Trainees will get the subtask practice they need whether or not it is a part of the training program. They will steal the time for this from whole-task practice. When trainees block during practice, or do not remember how to perform certain steps, or get the parts of one step mixed up with the parts of another step, then they have not mastered the subtasks and will force instructors to redemonstrate subtasks. Instructors will have to give this subtask practice or pass the trainees on without requiring them to demonstrate whole-task proficiency.

4.1.3 Practice Incomplete (Question 60).

Practice was not provided for each critical part of each LO. Requirements for complete practice items are listed below by task content level:

TASK/CONTENT LEVEL	COMPLETE PRACTICE REQUIRES
REMEMBER-FACT	Recall or recognition
REMEMBER-CONCEPT	Recall of category definition
REMEMBER-PROCEDURE	Recall of all steps in correct order
REMEMBER-RULE	Recall of all steps and branch decisions in correct order
REMEMBER-PRINCIPLE	Recall of all in uses, effects, relationships
USE-CONCEPT	Classification of both examples and non-examples
USE-PROCEDURE	All steps performed in the correct order

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USE-RULE	All steps and branching decisions performed in the correct order
USE-PRINCIPLE	Explanation or prediction based on the principle

Practice for an LO cannot be counted as present in the instruction unless it is complete. If anything that needs to be included is omitted, trainees may be progressed in training without having the necessary skills for task performance. When, at some later time, they cannot perform to criterion, the blame usually falls on them. It is not their fault.

4.1.4 All Trainees Did Not Practice (Question 61).

All of the trainees did not practice, where practice is defined as in THE PROBLEM, above. The emphasis here is on the word "all." This is essentially a counting exercise. If there were 10 trainees at the training site and nine of them practiced, then "all" the trainees did not practice. When all the trainees did not receive practice, the problem is usually with the resources available for training. If there was not enough time, more time should be scheduled or additional training sites should be made available. If there were not enough instructors, then more instructors are needed or more time. Whatever the resource problem may be, it has to be corrected or "all" the trainees will not get the chance to be trained.

4.1.5 All Trainees Did Not Meet Required Standards in Final Practice (Question 62).

All of the trainees did not practice the task until unassisted performance to standard was reached. The question is, "How many were not required to do this?" If 10% are not required to demonstrate proficiency during practice, then 10% progressed in training without having the necessary skills for task performance. When, at some later time, they cannot perform on a level with their peers, the blame usually falls on them. It is not their fault. If time or resources positively prohibit all trainees from practicing until standards are reached, then standards should be relaxed for all the trainees, equally. This point cannot be emphasized too strongly.

Final practice should be the capstone for training event. All of the kmowledge taught by the instructors and the skills learned through demonstration and subtask practice come together in final practice. It is that point in training where the task statement from the training objective is addressed fully. Final practice is usually conducted in training but it is not always conducted well. In final practice, each trainee should practice until performance at or above standard is reached. Instructors should not allow trainees to progress in training until they have met the standard on at least one unassisted trial (two or three are better).

4.2 PRACTICE/DEMONSTRATION: Practice-Remembering

THE PROBLEM. Practice items for memory level objectives were inadequate. Either memory aids were not used where required, or the Practice Remembering item was not identical to the test item. Practice questions are included in instruction because they (1) focus on, and call attention to, information or tasks that must be learned, and (2) inform the student what the test will be like. For these reasons, Practice Remembering items must (1) test the same information as the test, and (2) have the same format as the test item so the student is not "tricked."

EVIDENCE for inadequate Practice Remembering items will come from Worksheets C1.1 Observation of Classroom Instruction, and C1.2 Observation of Demonstrations.

Question 45. Are memory aids used?

RECOMMENDATIONS for training program modification.

4.2.1 Memory Aids Not Used (Question 45).

Memory aids (also called mnemonics) were not used as help for memory level objectives. The practice remembering item differed in content and/or format from the test item, resulting in confusion to the students. Practice Remembering items must be the same as the test item. They must be the same format as the test item. (See DEMONSTRATION/PRACTICE: Practice-Test Consistency.)

Memory aids are most often used with Remember-Fact information, but they should also be used for other content types at the Remember level. Methods of construction memory aids are described in TAEG Report #60, Use of Mnemonics in Training Materials: A Guide for Technical Writers, by Braby and Kincaid (1978).

Memory Aids for Remember Fact Objectives: Clever rhymes and acronyms are often used to help learners remember facts. You're probably familiar with several. For instance, to help remember the number of days in each month, is the rhyme that begins, "Thirty days hath September ...." To help remember the notes of the treble clef that appear between the lines, we use the acronym F.A.C.E. Whenever you use either of these techniques, remember that while clever rhymes and acronyms are very helpful, contrived aids are very confusing. When materials do not lend themselves to the creation of good rhymes or acronyms, it's better to use a different type of help. Chunking is another type of memory aid. Chunking is used to break down large memory tasks into smaller logical groups.

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Memory Aids for Remember-Concept, Rule, or Procedure Objectives. With rules, concepts, or procedures which are difficult to remember but commonly used on the job, "old hands" at the job may have developed some verbal memory joggers to help them. Often these memory aids help them remember only the most difficult step, operation, or characteristic. For example, aviators use this jingle to help them remember whether to add or subtract when computing magnetic variation based on true variation: "East is least, but West is best." When teaching naive learners this rule, this jingle could be presented and explained so that they can remember that when heading East they should subtract, when heading West they should add.

Verbal memory aids are often quite difficult to create but if they are readily available can be quite useful. Another advantage of using "tried and true" jingles, acronyms, or other memory joggers is that there is some proof that they have been helpful because they have endured.

4.3 PRACTICE/DEMONSTRATION: Practice Using

THE PROBLEM: Practice Using items were inadequate. They did not reflect what is to be done on the job or in later training, or were not sequenced properly, or did not differ from the examples.

EVIDENCE for inadequate Practice Using items will come from Worksheets C1.3 Observation of Insolated Practice, and C1.7 Observation of Integrated Practice.

> Question 47. Are PRACTICE USING items sequenced from easy to hard?

> Question 48. Do PRACTICE-USING items provide opportunities for COMMON ERRORS to be made?

> Question 49. Are PRACTICE items different from EXAMPLES?

> Question 50. Does PRACTICE USING integrate tasks as they are integrated in the "real world?"

RECOMMENDATIONS for training program modification.

4.3.1 Items Not Sequenced From Easy to Hard (Question 47).

Practice Using items were not sequenced from easy to hard. Tasks are often difficult to learn when their full conditions and standards are imposed on early practice items. In order to teach someone how to perform such tasks, it is often necessary to make it easier to do at the beginning. To do this, the conditions and standards can be relaxed. The action, however, should never be changed.

4.3.2 Opportunities Not Provided for Common Errors To Be Made During Practice (Question 48).

Practice questions or exercises did not allow students to choose or commit most errors common in the real job task. Practice should include the opportunity for students to make common errors. The feedback should then clearly show why the error is wrong, and how to avoid it.

Identification of common errors often requires consultation with a subject matter expert. His familiarity with the task or objective should enable him to think of the common mistakes trainees make when performing the task or the behavior required by the objective. If, for example, the objective involves applying a rule, common mistakes might involve things like:

1. Confusing one type of data with another (e.g., mixing similar symbols, "C" for "Cl" in chemical formulas).

2. Confusing the operations involved in using the rule (e.g., adding instead of subtracting).

3. Misreading tables or other presentations of the data (e.g., taking information from the wrong column or row in a table, etc.).

4. Being unable to use difficult forms of data (e.g., numbers in fraction, large decimal, or square root form).

5. Making computational errors (e.g., misplacing decimals or making common multiplication errors).

4.3.3 Practice Items Not Different Than Examples (Question 49).

Practice items for Use Concept, Rule, or Principle objectives did not differ from previous examples. Practice Using items for concepts, rules, and principles must be different from the test items and examples (even though they are the same format). They must be different because these content types require the student to be able to deal with problems or situations that are new. (For procedures, nothing new is required, so the practice is the same as the test.) One exception is that common error items might be the same.

4.3.4 Practice Requirements Differ from Job Requirements (Question 50).

Practice Using did not integrate tasks as they are integrated in the "real world." The practice session should, as closely as possible, match actual job conditions and should require trainees to practice tasks together that would be performed together on the job. In other words the practice should approximate job requirements. The extent to which this can be done may be limited by resource constraints, but such constraints can often be overcome with a little ingenuity. Talk to the training observers to find out why they rated Question 50 a "2" or "3." Take their observations to the training developer to see if more realistic practice can be developed.

4.4   PRACTICE/DEMONSTRATION: Demonstrations

THE PROBLEM.   The demonstration that was given to the trainees was not effective.   The instructor did not show how to correct/avoid common errors, the steps in the demonstration were too large or small, or they were not demonstrated in the same sequence as they were performed in the real world.

EVIDENCE for poor demonstrations will come from the Worksheets C1.1 Observation of Classroom Instruction, and C1.2   Observation of Demonstrations.

>   Question 42. Do DEMONSTRATIONS show how to correct/avoid common errors?

>   Question 43. Are steps in a DEMONSTRATION the appropriate size?

>   Question 44. Are tasks and task steps DEMONSTRATED in the same sequence as they are performed in the "real world?"

RECOMMENDATIONS for training program modification.

4.4.1   Demonstrations Did Not Show How to Correct or Avoid Common Errors (Question 42).

The instructor did not include guidance on methods for avoiding or correcting errors typically made on the job.   Demonstrations should include an explanation of the steps on which students usually make errors and, if possible, tell the student how the error can be avoided.   You may need to consult with a subject matter expert to determine the likelihood of common errors.

4.4.2   Demonstrations Not Conducted in Small Enough Steps (Question 43).

Demonstrations were not conducted in small enough steps so that the trainees could easily follow the instructor's actions.   Step size refers to the amount of information needed to get from one step to another in task performance.   We are all familiar with very large step sizes from high school.   They usually came in mathematics books when the author said, "The solution is obvious and left up to the student."   The solution was seldom obvious because the step size was too big.   There was too much information needed to get from that to problem solution.   Large step sizes are all right for trainees who have already mastered the tasks but trainees new to the task have to have it broken down into   small steps so they can follow along without getting lost between steps.

Clues to problems with step size will come from observations made by the training observer.   If instructors backtracked to add information (filling in between steps) that they felt was necessary for complete understanding, or added information to the instruction that is not part of the current lesson materials, then they are already aware of the step size problem.   They need to bring the lesson plan into conformance with practice by adding the additional steps or information to the plan for giving the demonstration.

If instructors had to backtrack to add information in response to trainee questions, and this information appeared to add to trainee understanding, the instructors have not identified a set of needed additional steps. They need to organize the information or steps they developed in response to questions and include it in the lesson plan.

4.4.3 Tasks or Task Steps Demonstrated Out of Sequence (Question 44).

The instructor did not demonstrate tasks or task steps in the same sequence as they are performed in the real world. It is crucial that the instructor deal with exactly the same steps in the same order as presented in the lesson plan or technical manual to avoid confusing the student. On rare occasions, the order of certain steps within the procedure may be optional and should then be indicated as such.

4.5   PRACTICE/DEMONSTRATION: Team Practice

THE PROBLEM. Team practice, defined as the practice of a team function by all crew/team members in a realistic setting, either did not happen or did not happen as it should have. Team practice is essential to the development of team proficiency, i.e., the ability of a team or crew to successfully perform the coordination and communication tasks required of the team in addition to the individual skills involved. No matter how proficient individual team members are in their areas of individual responsibility, they will not learn to function as a team unless they practice as a team. It is essential that team practice conditions be the same as those of the real task and that adequate team feedback be provided.

EVIDENCE for missing or poor team practice will come from Worksheeet C1.7 Observation of Integrated Practice.

> Question 65. Is TEAM PRACTICE provided?

> Question 66. Are TEAM PRACTICE CONDITIONS the same as (or as close as possible to) those of the real task?

> Question 67. Is TEAM PRACTICE FEEDBACK provided?

> Question 68. Is FEEDBACK HELP for TEAM PRACTICE adequate?

RECOMMENDATIONS for training program modification.

4.5.1   Team Practice Missing (Question 65).

Trainees had no opportunity to practice team skills. The purpose of team practice is to provide for the acquisition and/or enhancement of team skills. Practice to proficiency on individual tasks will not produce individuals skillful in team situations. The development of some sort of "team awareness," or "team quality," is necessary. Individual proficiency is important to the overall success of the team, but it does not outweigh such team skill as cooperation, crew coordination, communication, and tactical decision making.

In order to present trainees with the opportunity to practice the variety of team interactions present in tactical combat situations, it is necessary to develop a progression of practice scenario presentations. This series of scenarios should incorporate increasing complexity in regard to team member roles, information flows, decision and problem solving requirements, coordination activities, and evolution of tactics as the battle progresses.

4.5.2   Team Practice Conditions Unrealistic (Question 66).

Team practice conditions were not the same as (or as close as possible to) those of the real tasks. In order to adequately prepare trainees for combat, team practice scenarios should be as realistic as possible. Initial team practice conditions may be simplified so as not to overwhelm the trainees. Problem complexity should be increased as trainees demonstrate proficiency in their established team roles. For example, early scenarios might deal with

established situations in which all action-relevant environmental conditions and states of the system are specifiable and predictable. Later team practice might involve situations in which the previously predictable or knowledgeable conditions or states no longer hold. An example would be the sudden introduction of a disabled truck, or the failure of expected personnel to arrive. The latter kind of team practice more closely approximates combat conditions.

4.5.3 Team Practice Feedback Not Provided (Question 67).

Trainees were not told whether their team practice mission was successful or not, and if not, what they did wrong. Performance feedback is unquestionably the single most critical component in team practice. It is essential that team practice include clear and immediate reinforcement following each correct team response. Practice in the absence of team reinforcement for criterion-level performance may well lead to a decrease in team proficiency.

An approach used to provide team members with feedback or "knowledge of results" is the post-exercise debriefing. Debriefing sessions following team practice sessions provide an opportunity for the team to examine individual proficiencies and to explore alternative ways of organizing the task in order to develop more efficient and proficient team performance.

4.5.4 Feedback Help for Team Practice Inadequate (Question 68).

Feedback help for team practice was confusing or did not provide sufficient explanation. In order for team members to learn from their mistakes, they must be told how to correct them. However, a major source of difficulty in team training is the identification and correction of individual errors. In many complex team tasks, there are often many possible correct procedures, making error identification difficult. These conditions may foster the problem of monitoring or supervising team responses to evaluate their adequacy. Practice scenarios should be analyzed to determine critical procedures, decision points, communications, and coordinated activities which are linked to the mission outcome. This process, although subjective in nature, might be accomplished by a consensus of knowledgeable instructors. A feedback schedule may then be established for critical mission events.

4.6 PRACTICE/DEMONSTRATION: Feedback

THE PROBLEM. Trainees were not told whether they were right or wrong on each practice item, and, if wrong, the correct answer and why. For performance tasks on which a step-by-step process is required, feedback should be given for each step.

EVIDENCE for poor or missing feedback during practice will come from the following worksheets:

  C1.1 Observation of Classroom Instruction

  C1.3 Observation of Isolated Practice

  C1.7 Observation of Integrated Practice

  Question 63. Is FEEDBACK provided for PRACTICE?

  Question 64. Is FEEDBACK Help adequate?

4.6.1 Feedback Not Provided During Practice (Question 63).

Trainees were not given feedback during practice, as soon as possible following their actions. Trainees learn what they practice. It is important that they practice correct performance at all times. All trainee performance should be monitored by an instructor to insure that trainees are practicing correct performance. Since trainees may have no clear memory a few seconds later of how they responded, trainee errors should be corrected as soon after they occur as possible. Encouragement should be given during error-free performance to reinforce and "lock in" this performance. This necessary interaction between the trainee and the instructor must take place while practice is going on. Post-practice critiques will not correct faulty performance and do not "lock in" correct performance very effectively.

Practice feedback for REMEMBER level objectives simply provides the student with a correct answer to compare with his own. Adequate practice feedback should provide a complete answer to the item, provide the learner with immediate access to the feedback, and clearly display the feedback and identify the items to which it relates.

Practice feedback for USE CONCEPT objectives should contain the correct and clearly identified answer to the problem. It should isolate critical characteristics, and point out the missing critical characteristics in non-examples. To the learner it is quite important to be shown why a practice item is an example of a concept or why it is not. USE CONCEPT practice feedback should also point out and explain common errors and give a reference for correcting them, when appropriate.

Practice feedback for USE PROCEDURE objectives involves giving the learner detailed information on the adequacy of his performance. The instructor should respond to each mistake the student makes. Since the purpose of feedback is to help the student learn the material, whenever possible the

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instructor should have the learner discover the reason for his mistake. He should direct the learner to a reference where he can locate the source of his problem. Again, while the instructor should give feedback on both correct and incorrect responses, he should emphasize the correction of errors.

Practice feedback for USE RULE objectives does not merely provide the student with the correct answer. The instructor should add information which explains how to arrive at the correct answer so that the learner is able to find mistakes. Adequate feedback for USE RULE practice items should contain the correct and clearly identified answer to the problem. It should present a step-by-step application of the rule. When formulas are used, feedback should consist of showing all the logical steps worked out. Finally the feedback should point out and explain common errors, and give a reference for correcting them, when appropriate.

4.6.2 Feedback Help Inadequate (Question 64).

Feedback Help was confusing or provided insufficient explanation, e.g., consisted of a repetition of the original presentation. Students sometimes make errors because they did not learn from the original presentation. Therefore, when possible, feedback should include additional information or a different version of the information than was originally presented. Some types of help for different content types are given in the Recommendations for Question 35 paragraph 4.4.4), "Does Statement Help Provide Sufficient Explanation?"

4.7 PRACTICE/DEMONSTRATION: Job Performance Aids

THE PROBLEM. Job performance aids were not an integral part of training. If job performance aids exist for a task, they should be used actively during training, and should be usable. Training should focus more on the use of the job performance aid than on task performance without benefit of the job performance aid.

EVIDENCE for job performance aids not being an integral part of training will come from the following worksheets:

   C1.1   Observation of Classroom Instructon

   C1.2   Observation of Demonstrations

   C1.3   Observation of Isolated Practice

   C1.7   Observation of Integrated Practice

   Question 36. Does training include instruction on the use of required job
                    performance aids?

   Question 51. Are job performance aids (JPAs) usable?

   Question 52. Do all students use the job performance aid (JPA)?

RECOMMENDATIONS for training program modification.

4.7.1 Trainees Not Instructed on the Use of Job Performance Aids (Question 36).

Job performance aids were not adequately introduced and explained; consequently, students did not know how to use them. Instruction should include objectives on how to use the aids, or how to find them, or additional fact objectives on the vocabulary. The job performance aids should be used by the instructor in examples and demonstrations.

4.7.2 Job Performance Aids Not Usable (Question 51).

Job performance aids were inaccurate and/or were not of much help to the trainees. There are many poorly designed job performance aids in the world of work. Job performance aids may have been hard to find, or hard to use, or may have used different technical vocabulary from that used in training. If this happened, it is obvious that new job performance aids are needed. Until these job performance aids are produced, training is probably better off without them. (In that event, the objective should be rewritten as USE UNAIDED, and a previous REMEMBER objective should be included in the instruction.)

4.7.3 Trainees Do Not Use the Job Performance Aid (Question 52).

Job performance aids were available/required for task performance, but some or most of the trainees did not use them. The job performance aids may have been hard to find, or hard to use, but in any case, they were not an integral part of instruction. If a job performance aid for this task currently exists but was not made an integral part of training, the training program should be revamped to focus on this job performance aid. The training process should be such that the primary emphasis is placed on the job performance aid rather than task completion. After the initial terms and concepts needed to use the job performance aid to perform the task are mastered by the trainees, the demonstration and practice events should aim toward making the trainees masters of the job performance aid. The test, too, should be on using the job performance aid to perform the task. The most useful examples here are in the maintenance area. Maintenance personnel should be taught to use the manuals and associated tools to repair/replace equipment rather than being taught to perform the repair/ replace functions only. This requires that each trainee be given a job aid at the beginning of training to keep and to annotate as deemed necessary by the trainee.

4.8   PRACTICE/DEMONSTRATION: Practice-Test Consistency

THE PROBLEM.   Practice items did not match the task/content level,
conditions, or standards of the test item, or the practice item format was not
the same as the test item format.   Practice questions or exercises are
included in instruction because they (1) focus on, and call attention to,
information or tasks that must be learned; and (2) inform the student about
what the test will be like.   For these reasons, practice items should match
the test items.

EVIDENCE for a practice-test mismatch will come from Worksheets C1.3
Observation of Isolated Practice, and C1.7   Observation of Integrated
Practice.

> Question 46. Does each PRACTICE REMEMBERING item have the same
> content and format as the test item?

> Question 53. Does the TASK LEVEL of the PRACTICE item match that
> of the test item(s)?

> Question 54. Does the CONTENT TYPE of the PRACTICE item match
> that of the test item(s)?

> Question 55. Does the FORMAT of the PRACTICE item match that of
> the test item?

> Question 56. Do the CONDITIONS of each FINAL PRACTICE item
> match those of the test item(s)?

> Question 57. Do the STANDARDS of each FINAL PRACTICE item
> match those of the test item(s)?

RECOMMENDATIONS for training program modification.

4.8.1   Practice Item Task/Content Level Improperly Matched with Task Item Task/Content Level (Questions 46, 53 and 54).

The task/content level of the practice item did not match the task/content
level of the test item.   Recalling the task/content matrix (Figure 2), this
means that the action verb on the practice item was not the same or the
action verb on the test item, or that the same behavior was not required.
The result is that the students are practicing something different from what
they will later be tested on.

Here are some examples of practice item-test item mismatches on
task/content level:

(1) PRACTICE ITEM: In the space below, list the major battles in France
during World War II (as outlined in your text).

TEST ITEM: In the space below, list the major battles in France
during World War II (as outlined in your text). Include the dates of
each battle.

CONTENT TYPE

	FACT	CONCEPT	PROCEDURE	RULE	PRINCIPLE
REMEMBER	RECALL OR RE-COGNIZE NAMES, PARTS, DATES, PLACES, VO-CABULARY DEF-INITIONS, ETC.	REMEMBER THE CHARACTERISTICS OF EACH CON-CEPT AND THE GUIDELINES FOR CLASSIFICATION.	REMEMBER THE STEPS OF THE PROCEDURE.	REMEMBER THE FORMULA OR THE STEPS OF THE RULE.	REMEMBER THE RELATED PROCE-DURES, OR CON-CEPTS TO BE SELECTED FROM AND APPLIED OR THE STATEMENT OF THE PRINCIPLE.
USE-UNAIDED		CLASSIFY OR CATEGORIZE OBJECTS, EVENTS, IDEAS; ACCORDING TO THEIR CHARAC-TERISTICS, WITH NO MEMORY AID.	APPLY THE STEPS OF THE PROCEDURE IN A SINGLE SIT-UATION OR ON A SINGLE PIECE OF EQUIPMENT, WITH NO MEM-ORY AID.	APPLY THE FORMULA OR RULE TO A VARIETY OF PROBLEMS OR SITUATIONS, WITH NO MEM-ORY AID.	USE THE PRIN-CIPLE TO DES-CRIBE WHY OR HOW THINGS HAPPEN OR WHAT WILL HAPPEN, WITH NO MEMORY AID.
USE-AIDED		GIVEN CONCEPT CHARACTERIS-TICS AND GUIDE-LINES, CATE-GORIZE OBJECTS, EVENTS, IDEAS, ACCORDING TO CHARACTERIS-TICS.	GIVEN STEPS OF THE PROCEDURE, APPLY THE PRO-CEDURE IN A SINGLE SIT-UATION, OR ON A SINGLE PIECE OF EQUIPMENT.	GIVEN THE FORMULA OR RULE STEPS, APPLY THE FORMULA OR RULE TO A VARIETY OF PROBLEMS OR SITUATIONS.	GIVEN A STATE-MENT OF THE PRINCIPLE, DESCRIBE WHY OR HOW THINGS HAPPEN OR WHAT WILL HAP-PEN.

TASK LEVEL

Figure 2   TASK/CONTENT CLASSIFICATION MATRIX

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COMMENT: Nothing about dates is mentioned in the practice item. Although the action verb is the same, the behavior called for on the test is different.

(2) PRACTICE ITEM: In the space below, write the steps of the procedure for message recepton and duplicate checking. You will receive full credit only if you list all steps exactly as stated in NTP-4 in the correct order.

TEST ITEM: Use the current edition of NTP-4 to receive the following message and check for duplicates.

COMMENT: The practice item is Remember-Procedure. The test item is Use-Aided Procedure.

(3) PRACTICE ITEM: In the space below write the principles of operation of a rotary gear pump, as they were described in TM-XXX.

TEST ITEM: In the space below list the part names and functions of a rotary gear pump.

COMMENT: The task/content level of the practice items is Remember-Principle, while the task/content level of the test item is Remember-Fact.

If the practice item and test item differ in task/content level, check the objective to see which is correct and recommend that the training or test developer modify the incorrect item.

4.8.2 Practice Item Format Improperly Matched with Test Item Format (Question 55).

The practice item format was not the same as the test item format. There are a number of different item formats. These are listed below:

- True-False

- Multiple Choice

- Matching

- Fill-In

- Short Answer

- Listing

- Performance

Here are two examples of practice item-test item mismatches on item format:

(1) PRACTICE ITEM: Which of the following is the correct rule for finding total inductance in a series circuit?

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A. $E = IR$

B. $\lambda_c = 2\pi RL_c$

C. $R = IE$

D.   None of the above.

TEST ITEM: In the space below write the correct rule for finding total inductance in a series circuit.

COMMENT: The practice item is multiple choice and calls for a selected response. The test item calls for a constructed response. Since it is easier to select the correct response than to provide it from memory, the students have not had sufficient practice (assuming the test item matches the objective).

(2) PRACTICE ITEM: Using your scope and audio output, identify the following signals according to circular, sector, conical, or steady types of scans.

TEST ITEM: Describe the radar signal parameter measurement characteristics of each type of scan: circular, sector, conical, and steady. For credit all characteristics must be described.

COMMENT: The practice item is a performance item, while the test item has a fill-in format. If the objective calls for a paper and pencil answer, the practice provided may be "overkill."

If the practice item and test item differ in format, check the objective to see which is correct and recommend that the training or test developer modify whichever item is incorrectly formatted.

4.8.3   Final Practice Conditions Improperly Matched with Test Conditions (Question 56).

The conditions in the final practice item, or the conditions under which practice is administered, did not match the conditions in the test item. If the conditions do not match, students may not have been adequately prepared for the test. Here are some examples of practice test items with mismatched conditions.

(1) PRACTICE ITEM: Which of the following is the correct rule for finding total inductance in a series circuit?

A. $E = IR$

B. $\lambda_c = 2\pi RL_c$

C. $R = IE$

D.   None of the above.

TEST ITEM: In the space below, write the correct rule for finding total inductance in a series circuit.

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COMMENT: In the practice item, the student is given several rules, one of which might be the right one. In the test item, the student is not given anything except instructions to state the rule.

(2) PRACTICE ITEM: _____is the symbol for resistor.

TEST ITEM: Several schematic symbols for common electronic components are shown below. Write the name of the component represented by each symbol in the space provided.

COMMENT: The test item says that the student is given symbols. The practice item does not give a symbol.

(3) PRACTICE ITEM: List the steps for calibratng an 10XMX-2817V test prod using an oscilloscope. For full credit you must complete this in ten minutes. You will receive partial credit if you take longer.

COMMENT: The test item gives a student an oscilloscope to use. The practice item requires a paper and pencil answer.

(4) PRACTICE ITEM: Here are diagrams representing the last two phases of the basic steam cycle. Using these as memory aids for the principles illustrated by them, analyze how the phases apply in the correct operation of the auxiliary condensate-system.

TEST ITEM: Here are diagrams representing the phases of the basic steam cycle. Using these as memory aids for the principles illustrated by them, analyze how the phases apply in the correct operation of the auxiliary condensate system.

COMMENT: The test item states that diagrams are given for the entire steam cycle. The practice item specifies that only the diagrams for the last two phases are given.

If the practice and test items differ in condition, check the objective to see which is correct and recommend that the training or test developer modify the incorrect item.

4.8.4 Final Practice Improperly Matched with Test Standards (Question 57).

The standards in the practice item, or the standards for scoring the practice item, did not match the standards in the test item. In criterion referenced instruction, standards are not arbitrarily selected. It makes no sense, for example, to require a student to get 80% of the items right during practice, if he needs to recall all of the information on the test. The standard specified in the objective should be used for both final practice and the test. Here are two examples of practice and test items with inconsistent standards.

(1) PRACTICE ITEM: In the space below list the part names and functions of a rotary gear pump.

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TEST ITEM: In the space below write the principles of operation of a rotary gear pump, as they were described in TM-XXX.

COMMENT: The standards for the test item are provided in TM-XXX. It is not clear whether this manual has the information required by the practice item.

(2) PRACTICE ITEM: The following message will be transmitted via teletype tape. Accept it, verify it, and log it. You will receive full credit if you perform these steps accurately within 30 seconds.

TEST ITEM: The following message will be transmitted via teletype tape. Process it according to the procedure you have learned. You will receive full credit if you perform the steps accurately within 5 minutes.

COMMENT: The practice item says 30 seconds per message. The test item allows 5 minutes.

If the standards of final practice do not match those of the test, the practice and/or test standards should be brought in line with the objectives. If the objectives are wrong, they should be changed.

5. TESTING

5.1 TESTING: Objectives-Test Consistency

THE PROBLEM. The test was not a good measure of the training objective. That is, it was not a good measure of the extent to which the training program provided trainees with the skills and knowledges necessary to perform the required tasks to standard. The purpose of a training program is to bring everyone to proficiency on the tasks in the training objectives. The purpose of the test is to determine if the trainees are actually proficient on the tasks in the training objectives. If the test tasks, conditions, and standards do not match the training tasks, conditions, and standards, there is no way of knowing if the training program has actually brought the trainees to proficiency.

EVIDENCE for a test-training mismatch will come from the following worksheets:

E2.1 Summary of Test Adequacy Data for Objectives

E2.2 Summary of Test Adequacy Data for the Test

Question 1. Is the test FORMAT appropriate to the TASK LEVEL and CONTENT TYPE of the OBJECTIVE?

Question 2. Are there test items for the TLO or all of its critical parts/LOs?

Question 3. Is there a test item for each critical part of each LO?

Question 4. Does the TASK LEVEL of the test item match the TASK LEVEL of its OBJECTIVE?

Question 5. Does the content of the test item match the content of its OBJECTIVE?

Question 6. Do the CONDITIONS of the test item match the CONDITIONS of its OBJECTIVE?

Question 7. Do the standards of the test item match the standards of its OBJECTIVE?

RECOMMENDATIONS for training program modification.

5.1.1 Test Format Inappropriate To the Task/Content Level of the Objective (Question 1).

There are a number of different test item formats, and these may be more or less appropriate depending on the task/content level of the objective. Figure 3 shows the acceptable test formats for each task/content level.

Notice that at the REMEMBER level, recognition items (multiple-choice, matching, true-false) are usually not appropriate. This is because they don't

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If Task Level Is:	And Content Type Is:	Then Test Format Is:
REMEMBER	FACT for RECALL, CONCEPT, PROCEDURE, RULE, or PRINCIPLE	short answer, fill-in or listing
		performance (for a later USE-UNAIDED objective)
		performance (for a later USE-AIDED objective)
		matching, true-false, or multiple choice
	FACTS FOR RECOGNITION	matching, true-false, or multiple choice
		performance
		short answer, fill-in, or listing
USE-UNAIDED or USE-AIDED	CONCEPT	performance, matching, true-false, multiple choice, short answer, or fill-in
		listing
	PRINCIPLE, RULE, or PROCEDURE	performance, true-false multiple choice, short answer, or fill-in
		listing or matching

Figure 3 APPROPRIATE TEST FORMATS FOR TASK LEVELS AND CONTENT TYPES

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test recall, only recognition. Most REMEMBER level objectives require recall because of the nature of the job.

Recognition can be appropriate, however, in two situations at the REMEMBER level. The first occurs with FACTS, when a selection must be made from a group of objects, locations, etc. For example, the task "go to the tool box and get a ball-peen hammer" is a REMEMBER-FACT recognition task.

The second situation can occur for any content type at the REMEMBER level when the job only requires the student to be generally familiar with the REMEMBER level information. This situation only happens when the student is being prepared for later on-the-job or formal training, and even then, only when the student will be closely supervised. This is because the supervisor can correct memory failure. For example, a student performing the steps of a maintenance procedure on a piece of equipment may not need to have memorized the steps if the supervisor was available to correct any errors or to tell what to do next. Even in this situation, it would have been more efficient and more consistent with the job if the student had been required to recall the steps of procedure during training. If training time is limited, the recall performance criterion may be lowered when the job only requires "general familiarity," that is, when students are permitted to perform at less than 100%.

If you have a situation in which recognition is appropriate for a REMEMBER level objective, multiple-choice, matching, or true-false test items may be appropriate, even if the content type is concept, procedure, rule, or principle. These do not appear on the chart above, because even though they can be used, they are not the best choice. In this situation, it is also a good idea to recheck a recognition objective to make sure it is appropriate for the job.

Multiple-choice, matching, and true-false items may be appropriate, if carefully designed, for many USE-level tasks. For example, a category classification is often a true-false judgment. If the student must solve a math problem (Use-Rule), a multiple-choice item in which all alternatives are reasonable is appropriate. Also, some USE-Principle predictions involve a limited set of possible alternatives; again, multiple-choice is appropriate.

The reason why test item format is important is that students are not dumb! The first thing most new students do in a course is find out how they will be tested. Then, they study material in order to to pass the tests. If the objective requires a student to memorize something, multiple-choice tests should not be used, because students will learn in order to recognize, but not to recall. From your own experience, it should be clear that students study less carefully for a multiple-choice or true-false test, than for a completion or short-answer test. The test items and the format should therefore be like the tasks the student will do on the job.

5.1.2 A Test or Test Item Missing for Some Objectives (TLO or LOs), or the Critical Parts of the LOs (Questions 2 and 3).

A Terminal Learning Objective (TLO) is a specific description of the action with conditions and standards, to be performed after training. A Learning Objective (LO) is an objective which specifies a performance which is a part

of or a prerequisite to the action specified by its superordinate learning objective or TLO. Critical parts/LOs have the following characteristics:

- They are some of the most measurable and observable elements of the task.

- They have serious consequences of inadequate performance.

- They are common sources of failure.

- They are actions which are not already known and therefore must be taught.

For the REMEMBER task level, each piece of information is critical. Each of the following should be tested:

- Facts

- Concept characteristics

- Procedural steps

- Steps and conditions for branching in a rule

- Guidelines in a principle.

For the USE-AIDED and USE-UNAIDED task levels, the parts of the OBJECTIVE's ACTION are critical:

- For CONCEPTS, are all CRITICAL CHARACTERISTICS tested?

Can you be sure the student knows each one and can you identify which ones the student does not know?

- For PROCEDURES, is each step performed?

- For RULES and PRINCIPLES, is each step performed? Are there items for all possible branches or decisions, or at least those that would commonly occur on the job?

5.1.3 Test Item Task Level Improperly Matched With Objective's Task Level (Question 4).

The task level of the test item (Remember, Use-Unaided, or Use-Aided) should match the task level of the objective. This means that the action verb in the test item should be the same as the action verb in the objective, or at least the same behavior must be required. If not, the test item is measuring something different than what was required in the objective.

5.1.4 Test Item Content Improperly Matched with Objective's Content (Question 5).

For the REMEMBER task level, the item should test the identical information specified by the objective. For the USE-AIDED and USE-UNAIDED task

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levels, the action of the items, or the combined actions of a group of items, should be the same as the objectives action.

EXAMPLE: Objective: Given the necessary tools and an operator's manual, the student will set up and operate a double-acting reciprocating pump, in five minutes and according to the manual specifications.

Inconsistent test item: "List the steps of procedure for starting, operating, and stopping a double-acting reciprocating pump."

This test item is inconsistent, because its task/content is REMEMBER PROCEDURE instead of USE-AIDED-PROCEDURE. Notice that the action the student is to perform in the test is not the same as the action required in the objective.

Consistent test item: "Use the operator's manual, and necessary tools to set up and operate a double-acting reciprocating pump. You will pass this test if you complete this task within 5 minutes, in accordance with the manual specifications."

5.1.5 Test Item Conditions Improperly Matched with the Objective's Conditions (Question 6).

The conditions statement in the training objective should determine the conditions for both training and testing. Consequently, the conditions for the training and testing should be the same. If the problem is that the correct training or testing conditions cannot be set up for some reason, find out why. If material and/or facilities required by the lesson plan exist but are not available or cannot be guaranteed, suggest that training and testing be redesigned for material and/or facilities that can be guaranteed. Beware of impossible conditions, i.e., "NBC" conditions, that cannot be reproduced. Such conditions are essentially "no" conditions since they cannot be generated. If the test conditions are more difficult than the training conditions, poor trainee performance is probably more a function of conditions than trainee learning (since the trainees have not had a chance to practice under these conditions). If the test conditions are easier than the training conditions, poor trainee performance under these easier conditions almost guarantees poor trainee performance under the more difficult conditions of training. In either case (test conditions easier or harder than training conditions), the test and/or training conditions should be brought in line with the objectives. If the objectives are wrong, they should be changed.

5.1.6 Test Item Standards Improperly Matched with the Objective's Standards (Question 7).

First, if the standard, as written in the training objective, is not clear, is missing, or does not specify how well the trainees must perform, it needs to be rewritten. The standard must specify clearly and specifically how well the trainees must perform to be a GO. The standard must have real meaning for the trainees. It must be communicated to them, and be written in the lesson materials, in words that they understand and can use to judge their own performance. This standard should be used in the final stages of practice (it is the standard the trainees must meet in practice) and in the test. If the training and testing standards are not the same, the test and/or training

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standard should be brought in line with the objectives. In criterion-referenced testing, standards are not arbitrarily selected. It makes no sense, for example, to require a student to get 80% of the items right, if he needs to recall all the information. On the other hand, for some tasks, a 70% or 80% criterion may be reasonable. In all cases, though, the standard specified in the objective should be used.

5.2 TESTING: Test Instructions

THE PROBLEM. The instructions given to the trainees at the beginning of the test were not clear enough so that the trainees could easily understand what they were expected to do and how well they were expected to do it. This may have occurred because the test administration directions were incomplete, or the instructor did not follow them, or because the test instructions provided to the students were inadequate. Test instructions must be clearly presented to the trainees.

EVIDENCE for ambiguous test instructions will come from the following worksheets:

C1.4 Observation of a Performance Test

C1.5 Observation of a Written Test

C1.6 Observation of an Oral Test

Question 21. Are test administration directions complete?

Question 22. Do instructors follow the directions when administering the test?

Question 23. Are adequate test instructions provided to the student?

RECOMMENDATIONS for training program modification.

5.2.1 Incomplete Test Administration Directions (Question 21).

Instructions for administering the test were incomplete or unclear or were missing altogether. The instructions for administering the test should be written so as to insure standardization of test administration procedures across examiners. The lesson plan should outline precisely how the test is to be administered. Included should be the placement of personnel and equipment and test administration procedures that specify the testing sequence and guide the evaluator in testing the soldiers on each of the tasks to be performed. Such guidance for the evaluator is needed in order to insure that each soldier is tested in the same way.

5.2.2 Instructors Did Not Follow Test Administration Directions (Question 22).

Test administration directions exist, but the instructor did not follow them. There are any number of reasons why this may occur. For example, if examiners do not have stopwatches, rigid time standards cannot be adhered to. "Political" pressures may force instructors to allow students to exceed time standards or to give hints, prompts, or cues during the test in order to obtain the required percentage of "GCs". Instructors may feel that they know better than the test developers how the test should be administered. If lack of compliance is due to resource constraints, these should be noted, and the required resources obtained, if possible. Problems with deliberate departure from established test procedures and standards will have to be settled with the training manager.

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5.2.3 Test Instructions Unclear or Inappropriate for Item Type (Question 23).

Test instructions get the trainee in the right mental frame of reference. To do this, they have to be crystal clear to the trainees. They should also get each trainee into the same mental frame of reference. To do this, they have to be given to each trainee in exactly the same way. This is why test instructions are standardized and are written down for the examiner to read. The examiner should read these instructions, just as they are written, for each trainee. If the trainees did not seem to understand what was required of them after hearing the test instructions, then the instructions themselves may need to be rewritten. Test instructions should tell the trainee what he or she will have to do, the conditions they will have to perform under, the equipment/tools they will have and can use, how much time they will have, and the standards for successful completion of the task. Any rewritten instructions should be "tried out" on a couple of trainees who are typical of normal input to training.

Guidelines for test instructions for various types of content follow:

Test Directions for Memory Level Items (i.e., Remember - Fact, Concept, Procedure, or Rule)

Each test item (or section) should tell the student how to make the desired response (e.g., "State the items in the space provided below," "Circle the appropriate answer," "Label the controls on the attached illustration by writing the name next to each relevant control," etc.), what information is given in the item, and the criteria for performance (if exact order is important, exact words or paraphrases acceptable). Directions should be complete and specific. A trainer should also provide adequate space for a complete response. The amount of space needed for the average student to make a complete response should be indicated after the item. For fill-in-the-blank, short-answer, or multiple-choice items, lines should be drawn to indicate the placement and approximate length of answers.

Test Directions for Use-Concept Items

The learner should know exactly what to do with the information in each item. Directions should specify what to use in the problem (e.g., "Read the name of the concept and instances listed below it."), what to do with it (e.g., "Identify the examples of the concept."), and how to do it (e.g., "Place the letter of the answers in the space next to each concept name."). In addition, directions should tell the learner of any criteria pertaining to the (e.g., "All examples must be correctly identified for credit on the objective."). It is assumed that the criterion for performance is 100 percent if not stated in the objective.

Test Directions for Use-Procedure Items

These must include explicit instructions to the learner telling what he is to do, what to use to do it, what limitations there are on performance, and what the criteria are for adequate performance. This information should all be contained in the objective, which may simply be repeated or rewritten as a specific set of directions.

Test Directions for Use-Rule Items

Directions for completing the item should

1. **Clearly label what is given in the practice situation.**

   A student should be able to read a problem and know what information in the problem is needed to solve it. The information which is given to the student should have been mentioned in the conditions of the objective. In addition, when the information is presented in the problem, it should be clearly labeled and identified.

   For example, for the objective,

   Given the lengths of the two sides of a right triangle adjacent to the right angle, and the appropriate formula, calculate the length of the hypotenuse to $\pm$ .01 accuracy and show all work,

   the directions to the test item(s) for the student should read,

   Using the formula $c = a^2 + b^2$ and these values for the two sides:

   $a = 6 \qquad b = 9$

   find the hypotenuse c, showing all work and calculating to $\pm$ .01 accuracy.

2. **State the outcome to be produced from using the rule and include any necessary criteria (as stated in the objective).**

   The directions should also include the outcome and criteria which were stated in the objective. Using the example stated earlier, note the outcome and criteria.

   Using the formula $c = a^2 + b^2$ and these values for the two sides:

   $a = 6 \qquad b = 9$

   find the hypotenuse c, showing all work in the space provided and calculating to $\pm$ .01 accuracy.

   If the objective requires the student to calculate the answer, then the item should not require a different behavior (such as selecting the correctly worked problem).

3. **Specify the way the information should be used.**

   The directions specify what form the answer should take, where to place it, whether or not to show work, and, if required, where to show it. If multiple-choice items are used, the student should be told whether to circle his answer, write the response (or responses) in the given blank, etc.

5.3   TESTING: Test Adequacy

THE PROBLEM: Test items were inadequately designed. Items were unclear, ambiguous, not well constructed, or not free of hints. In other words, the tests may have been invalid and unreliable. If a test does not accurately and reliably assess trainee performance, you have no way of knowing whether the trainees can actually perform (or will fail to perform) when placed on the job. Put another way, if your tests are bad, your test scores are meaningless.

EVIDENCE for inadequate tests will come from the following worksheets:

B2   Product Evaluation - Evaluate Test Materials

C1.4   Observation of a Performance Test

C1.6   Observation of an Oral Test

Question 8. For true-false, multiple-choice, and matching items is only one answer correct?

Question 9. For short answer, fill-in, listing, and performance items are all acceptable answers in the answer key?

Question 11. Is the language of test item easy for students to understand?

Question 12. Is the test item different from previous PRACTICE and EXAMPLES?

Question 13. Is the answer to the test item given away by another item or group of items on the test?

Question 14. Is the answer to the test item dependent on answering a previous item or group of items correctly?

Question 15. Are sketches and diagrams used in the test item easy to understand.

Question 16. Is the test item tricky or misleading in that it points to an incorrect answer?

Question 17. Is the test item well-constructed?

Question 18. When steps are scored, does the instructor use a checklist?

Question 19. On selected response tests (i.e., true-false, multiple choice, or matching) is each correct answer position (e.g., a, b, c, or d) used about the same number of times?

Question 20. On selected response tests (i.e., true-false, multiple choice, or matching) are specific patterns of correct answer positions repeated in blocks?

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<u>RECOMMENDATIONS</u> for training program modification.

5.3.1 More Than One Answer Correct (Question 8).

There was more than one correct answer to a selected response (true-false, multiple choice, or matching) test item. The item is therefore likely to be difficult for the student to answer correctly.

Here is an <u>inadequate</u> multiple-choice item:

If you are driving down a steep grade, you would be likely to shift gears

> a.   down for power.
>
> b.   up for power.
>
> c.   down to decelerate.
>
> d.   down to slow the car.

The item is ambiguous because choices "c" and "d" are paraphrases of each other, giving two possibly correct answers.

Here is a <u>corrected</u> multiple-choice item:

If you are driving down a steep grade, you would be likely to shift gears

> a.   down for power.
>
> b.   up for speed.
>
> c.   down to decelerate.
>
> d.   up to reduce engine RPMs.

5.3.2 All Acceptable Answers Not in Answer Key (Question 9).

There were one or more correct answers to a short answer, fill-in, listing or performance item which were not included in the answer key.

Short Answer

The answer key should identify allowable alternatives. If only one exact answer is acceptable for a short-answer item, it might be more appropriate to convert it to a fill-in item. Short-answer items are most appropriate when learners are to have some flexibility while clearly specifying the requirements for a correct answer. The key indicates to the scorer what other forms of the answer are acceptable, e.g., "paraphrases are acceptable."

Here is an <u>adequate</u> short answer item:

> Item: Give the rules for computing the mean of a set of scores as a formula. No credit for partially correct answers.

Key: $\overline{X} = \dfrac{\Sigma X}{n}$ or the mean $= \dfrac{\text{sum of scores}}{\text{number of scores}}$

all available alternatives

Listing

Learners should not be penalized for having different wordings of the correct answer unless exact answers are necessary and called for in the directions. Any acceptable alternatives should always be included in the scoring key.

Fill-in

The item should be worded so that only one word or phrase correctly completes the sentence. If more than one answer may be correct, it might be more appropriate to convert the item to a short-answer format.

Performance

There may be several ways of deciding whether a performance is adequate (e.g., all steps performed completely and accurately in order vs. the final outcome of the procedure achieved vs. varying degrees of acceptable performance for different steps). Scoring criteria should have been specified in the objective which should be included in a performance checklist. If the performance objective allows for alternative behaviors (e.g. the order of steps within the procedure is optional, or it makes no difference whether all of the steps are performed as long as an acceptable final product is produced), then these allowable alternatives should be specified in the scoring criteria.

5.3.3 Test Item Contains Too Many Difficult Words or Long Sentences (Question 11).

The test item contained too many difficult words or long sentences (other than job-related terminology) for the reading level and verbal skills of the students. The purpose of a test item is to assess a trainee's skill or knowledge, not his reading comprehension or his vocabulary. Therefore, it is important NOT to exceed the student's reading level (or vocabulary level in an oral or performance test). Test items should use words that the student is familiar with, and should contain fairly short, uncomplicated sentences. Guidelines for lowering the reading dificulty level of instruction are provided in Section 3.6.3.

5.3.4 Test Item Used as Previous Practice or Example (Question 12).

A test item for a Use-Aided or Unaided Concept, Rule, or Principle was the same as a previously used example or practice item. All test items (except those testing common errors) should use instances not previously encountered by the learner in instruction. For example, for a Use-Concept test item, when the learner sees an example or non-example for the second time it is very possible that he will remember it, rather than the critical characteristics to classify it. For this reason, previously encountered examples and nonexamples in test items do not necessarily indicate that the concept has been learned, no matter how many of them the student answers correctly.

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You have only tested his ability to memorize specific examples and nonexamples. Recommend to the developer of the instruction that a large enough pool of items be developed to insure that different items can be selected for use as examples, practice, and test items.

5.3.5 Answer Given Away By Another Item or Items On the Test (Question 13).

The answer to a test item was disclosed by another item or group of items on the test. Often, test items are developed which when examined independently are found to be adequate, but which, when placed near to each other on a test, inadvertently provide hints to the test-wise student. For example, if the following item appears on a test:

> Ohm's Law is $E = IR$. If $I = 200$ ma., and $R = 47K$ ohms, then $E =$ _____.

there should not be another item on the test which asks the student to recall Ohm's Law.

5.3.6 Answer Depends On Answering a Previous Item or Items Correctly (Question 14).

Previous item(s) must be answered correctly in order to answer the test item correctly. Test items should stand alone. Response to one item should not be contingent upon response to previous items. Consider the following pair of items:

1. List the ten insects most common to the Southwest.

2. State the distinguishing characteristics of each insect listed in answer to Question 1.

In this case the student may know the distinguishing characteristics of all ten insects, but may do poorly on Question 2 because he cannot remember the entire list called for in Question 1. In effect he is being penalized twice for being unable to perform the behavior required by Question 1, while Question 2 is not accurately assessing his knowledge of the distinguishing characteristics.

5.3.7 Unclear Sketches or Diagrams Used in the Test Item (Question 15).

Sketches or diagrams used in the test item were difficult to understand or confusing to the students. Such difficulty can arise when the graphic conflicts with something the trainee is used to or has seen before, when it conflicts with the directions for answering the test item, or when it is poorly designed. It is not the purpose of this paragraph to detail how to design effective graphics for use in test items. Problems alluded to here should be described to training development and/or graphics personnel.

5.3.8 Tricky or Misleading Test Item (Question 16).

The test item was tricky or misleading in that it pointed to an incorrect answer. Consider the following example of a "trick" True-False item:

T F The area of a rectangle 4 ft. by 3 ft. is equal to 12 sq. yds.

This apparently true statement is rendered false by an insignificant detail. The purpose of a test item is to assess student skill or knowledge of the subject matter, not his ability to withstand the wiles of a sneaky test developer. Trick items also have a negative effect on student morale.

Test Item Poorly Constructed (Question 17).

The test item was not well constructed. Different criterion apply to different item formats. The test item violated one of the following criteria:

True-False

   a.   The item should include only one statement (idea) to be judged true or false. If an item contains two facts or pieces of information, one of which is true and the other false, learners may not know how to respond to the item.

For example, if a true-false item reads:

   T F Carrot seeds should be planted 1/16" deep and lettuce seeds 1/8" deep.

learners may be confused by having to respond to both facts. Likewise, if learners answer incorrectly, you do not know which piece(s) of information they do not understand correctly.

   b.   Negative statements and double negatives should not be used. Determining the truth or falsity of a statement that contains one or more negatives is confusing at best. Consider the following item:

   T F It is not appropriate to shift from a higher gear to a lower gear if added power is not necessary.

Learners reading this item must attempt to translate the statements into positive form before answering it. Why not do that work for them? You're not trying to find out if they can translate complex grammar; you want to determine whether they know when to shift gears.

   c.   The item should be short. When learners must read a very long statement before determining whether it is true or false, it may be difficult for them to pick out that part of the statement which is important. Long statements are also more likely to suffer from the other problems described in this section.

   d.   The item should not be so obvious that it can be answered correctly on the basis of common sense alone. For learners with any knowledge of English grammar, the following item would be obviously true.

T   F   An adverb is a word.

By asking such questions, which all learners would be expected to answer correctly, you find out nothing about the ability of learners.

e.   Absolutes like "none", "never", "all", and "every" should not be used. These key words provide irrelevant clues which allow the student to guess the correct answer on the basis of test sophistication when he really does not know the answer. Most items which contain words like "always" or "never" will be false since there are usually exceptions to every rule.

f.   The item should not contain the words "some", "and", or "generally". Since there are exceptions to every rule, most items which include words like "sometimes" or "possibly" will be true since these items will be the exceptions.

g.   The item should deal with things that are clearly either true or false. If the wording is ambiguous, learners may be answering questions different from those which you are trying to ask.

For example, a true-false item which reads:

T   F   A rhombus is a geometric figure with four sides of equal length.

would be true if it was interpreted to mean that a rhombus had those characteristics among others. A rhombus must also have two obtuse angles and must be in one plane. The item would be false if it was interpreted to mean that a rhombus was defined by only those characteristics. Note that while the words themselves may be clear, the entire statement has no clear interpretation.

Multiple Choice

a.   All alternatives should have the same grammatical structure. The following item, which offers alternatives that are not grammatically parallel, is an example of how one should not construct a multiple-choice test item:

A typical malfunctoning catalytic converter will emit a

a.   It gives out a blue gas

b.   Whining noise

c.   Non-operatonal

d.   Hard to say without more information.

Such items often confuse the student, thus increasing the chance that a student who has learned the objective will still respond incorrectly. In the corrected version below, the alternatives are grammatically parallel.

A typical malfunctioning catalytic converter will emit a

      a.   blue gas.

      b.   whining noise.

      c.   grating sound

      d.   periodic thud.

b.   <u>The item stem should be worded positively, that is, words like</u> <u>"no" and "not" should not be used.</u> Negatives in the item should be avoided if at all possible. If negatives must be used, they should be highlighted. If negatives within the stem are NOT highlighted, or in some way emphasized, learners may NOT notice them and may interpret the item incorrectly.

c.   <u>Repetitive phrases should be placed in the stem, rather than in</u> <u>the alternatives.</u> If the same words are part of every alternative, they should be placed into the stem once. The item

Carrot seeds

      a.   should be planted 1/16" deep.

      b.   should be planted 1/8" deep.

      c.   should be planted 1/4" deep.

      d.   should be planted 1/2" deep.

would be much better if the alternatives were only the numbers and the rest of the information was included in the stem.

d.   <u>Numerical choices should be listed in order of magnitude.</u> Choices containing numbers should be listed in descending or ascending order. The following item is not well constructed:

On the Fahrenheit thermometer water freezes at:

      a. 10°

      b. 64°

      c. 32°

      d. 0°

Here is the corrected version:

a. 0°

b. 10°

c. 32°

d. 64°

e. <u>The item should not require a great deal of reading</u>. Here is an example from dentistry that has lengthy alternatives:

Healthy gingiva ("gums") aid in the self-cleaning process by their

a. tendency to direct food particles toward occlusal surfaces.

b. tendency to force particles away from the proximal space.

c. tendency to deflect particles away from free gingiva on the interdental papillae.

d. close adherence to the tooth surface below the height of contour of the cervical enamel.

The above question, while technically correct, takes a good deal of time to read and requires some intensive study. It detracts from the testing process where a great many items can be asked in a short period of time. Therefore, items which require too much reading should be avoided whenever possible.

f. <u>Wording in the stem should be clear and unambiguous. so that only one correct answer is possible.</u> If the wording of the stem allows for more than one correct answer, whether or not more than one of those answers is present as an alternative, the item is likely to be difficult for the learner to answer correctly. Consider this example:

This figure is a

a. diamond.

b. parallelogram.

c. rhombus.

d. quadrilateral.
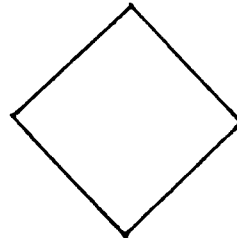
Any of the given answers could be correct, depending upon your interpretation. In order to limit the possibilities for the correct answer, more information is required in the stem.

g. <u>The article "a" or "an" should not be at the end of the stem.</u> If the stem and one or more of the alternatives are NOT grammatically consistent, the number of actual alternatives is reduced. For example, in the following item:

A part of speech which modifies a verb is an

    a.   noun.

    b.   preposition.

    c.   adjective.

    d.   adverb.

The choices "noun" and "preposition" could NOT be correct alternatives since "an noun" or "an preposition" is grammatically incorrect. A better item would be "which of the following is a part of speech which modifies a verb?"

h. <u>All alternatives should be plausible to someone who doesn't know the answer.</u> If an alternative is NOT plausible, or believable, nobody is likely to choose it. Common misconceptions make the best distractors since they are likely to be chosen by learners who do NOT know the correct answer. In the item below, alternatives "c" and "d" are not plausible; that is, few people would believe they are correct. Alternative "b," on the other hand, is more likely to be selected by someone who didn't know the correct answer.

Which of the following is the chemical symbol for gold?

    a.   Au

    b.   Go

    c. $

    d.   Gold

i. <u>Alternatives like "A and B only" or "All of the above" should not be used.</u> It is definitely easier to put one of these in as a final alternative than to think of something better, but they are limited in their usefulness because they can often be selected without complete knowledge of the item content. "None of the above" should NOT be used if the student is asked to select the "best answer" rather than the "correct answer."

j.   <u>Alternatives should be approximately the same length.</u>
Alternatives which are not similar in length can cause learners
to lean toward or away from the correct answer. A longer
answer is often correct because it has additional qualifications
that other answers omit. For example, in the item below,
alternative "e" is longer than the others and of a different form
since it is more limited and thus more likely to be correct.

If a graph is symmetric about the y-axis, which point(s) lie(s) on the graph?

    a.   (x, y)

    b.   (x, -y)

    d.   (-x, -y)

    e.   (-x, y) for every (x, y)

k.   <u>Paraphrases or synonyms in the alternatives should be avoided.</u>
A paraphrase or synonym for the correct answer would also be a
correct answer, so paraphrases should be avoided. Opposites are
frequently easier to come up with than other alternatives, but
they are often inappropriate, unless they really are plausible
alternatives.

Matching

a.   Directions should include statements of:

    1.   <u>the contents of each column.</u> The purpose of the item is
clearer to the learner if a name is given to each column.

    2.   <u>the basis for matching.</u> If the desired basis for matching
is not stated, a learner could conceivably match any
relationship which might exist between the entries in the
columns.

    3.   <u>how often choices may be used.</u> It is important for the
learner to know whether each choice can be used only
once or more than once.

    4.   <u>how many answers are possible for givens.</u> This can
sometimes be indicated indirectly in the wording of the
directions rather than stated specifically.

Below is an adequate set of directions for a matching item. The sections
related to each of the points above are marked with the corresponding letter.

Match the <u>state capitals</u> in column "A" with the <u>states</u>
               1   1

<u>in which they are capitals</u> in column "B". There will be
                2

<u>only one answer to each item</u> in "A" and <u>each item in "B"</u>
                4   3

<u>will be used only once.</u>

Leaving out any one of these sections would result in inadequate directions.

b.   <u>All choices should have the same grammatical structure.</u> (See Criterion "a" under Multiple Choice)

c.   <u>Numerical choices should be in order of magnitude.</u> (See Criterion "d" under Multiple Choice)

d.   <u>The item should not require a great deal of reading.</u> If the wording of the entries is long or difficult to interpret, then you are testing something more than the learner's knowledge of the desired relationship.

e.   <u>Choices should be arranged in some sensible order, for example, alphabetically or logically.</u> The following is a well-written matching item:

Match each prefix with its meaning. Each prefix has only one meaning and each meaning corresponds to only one prefix.

<u>Prefix</u>	<u>Meaning</u>
_____ 1. amb	a. About
_____ 2. circum	b. Above
_____ 3. super	c. Across
_____ 4. trans	d. Against
	e. Almost
	f. Apart
	g. Around

f.   <u>Unless choices can be used more than once, extra entries should be included in the choices column.</u>

If the columns are of equal length without repeated use of entries, learners may be able to match some entries by the process of elimination. If the entries in the choices column can be used more than once, the givens column can be the same length or longer than the choices column.

g. <u>None of the entries in either column should appear obviously different from others. One title should be appropriate for all entries in a column.</u>

If you cannot put a brief title on each column, then you probably have more than one class of things represented there. Different classes should be tested separately. For example, the list below includes both cities and states. While they might all be classified as locations, they should probably not appear in the same column of a matching item.

<div align="center">

Locations

Cities { Los Angeles
Houston
Minneapolis

Georgia
New Mexico } States
Oregon

</div>

h. <u>Each alternative should be a plausible answer for all or most of the problems.</u> (See Criterion "h" under Multiple Choice.)

Fill-in

a. <u>The blank should be at or near the end of the sentence.</u> When blanks are placed near the end of sentences, learners have a chance to get most of the meaning of the items before they see the blanks. This helps clarify what the items are trying to ask.

b. <u>One and only one word or phrase should correctly complete the item.</u> If the item is worded so that more than one answer makes it a true, complete sentence, any such answer can be justified as correct. It is important, therefore, to word items so learners must supply the intended correct answer in order to complete the sentence accurately. For example, the item

Columbus discovered America in <u>(1492).</u>

could be correctly completed by any of a number of words or phrases such as "a ship," "the Santa Maria," "the western hemisphere," "looking for the Orient," or "1492." If the item was intended to measure the year of discovery, it should say so. A better item would be

Columbus discovered America in the year <u>(1492)</u> .

c. <u>Multiple blanks should be avoided.</u> More than one blank per item frequently results in an item with little meaning. Frequently, these blanks can be correctly filled in a number of ways. For example, in the item

The symbol for (silver)   is (Au).

the blanks can be filled in correctly with any pair that includes a symbol and what it represents.

d. **Blanks should require key words.** The word left out of the sentence determines what the item is measuring. If trivial words are omitted, trivial things are being measured. It is also important that the correct answer NOT be a "magic" word which could be supplied by a learner without real understanding of the question. For example, in the item

Larger plants will usually be planted farther apart than (smaller) plants.

the word "smaller" is probably the first answer most people would think of whether or not they know anything about plant spacing. The key words in this item are probably "farther apart." Key words will be determined by what the item is intended to measure.

e. **There should be no grammatical cues to the correct answers.** Grammatical cues can sometimes help a learner who does NOT know the correct answer eliminate a set of possible wrong answers. In the item

A sentence must contain at least (one)   noun or noun substitute.

a learner who thought a sentence had to have two nouns would know what was wrong since "noun" in the sentence is singular.

Short Answer

a. **The required answer should be short.** Short answers consist of either phrases or one or two short sentences which supply the necessary information.

b. **Directions to the student should specify how the items will be scored without giving cues to the correct answers.** This provides the learner with exact information concerning how performance will be graded. It includes such things as number of points per portion of the answer, whether partial credit is given for partial answers, or whether the entire answer must be given for any credit.

c. **The scoring key should identify allowable synonyms or alternatives.** If only one exact answer is acceptable for a short-answer item, it might be more appropriate to convert it to a fill-in-the-blank answer item. Short-answer items are most appropriate when learners are to have some flexibility while clearly specifying the requirements for a correct answer. The

key indicates to the scorer what other forms of the answer are acceptable.

d.   The question should be complete with enough information for the learner to generate an appropriate answer. The question should provide enough information for the learner to know what is expected of him. It should tell him clearly what information he should include in his short answer.

e.   Credit should be given for each correct part of an answer. This is best accomplished by having a checklist of all the points in a good answer. For every correct portion of an answer, the student earns a number of points. For example, in the question "State four rules for safe encampment in a forested terrain," we might assign one point for each rule given that is correct.

f.   Questions should be clear so that all learners will have the same interpretation. All students should generally interpret what the question is asking in the same way. Being specific is one way to achieve this.

          BAD: Discuss safe encampment.

          BETTER: State four rules for safe encampment in a forested terrain.

g.   A model answer should be written for each question as an aid to scoring, or a checklist of attributes of a good answer should be provided for use in scoring.

Writing a model answer often helps the test item developer to understand the strengths and weaknesses of the question and can be the first step toward creating a checklist of attributes of a good answer. This checklist will help in scoring student responses. It is desirable to give students these model answers following the test so that they may better evaluate their performance.

h.   Items should be assigned points according to their importance.

i.   Point values should be made known before the test. Let the students know how much each item will count before the test.

j.   Items should be scored anonymously (scorer should grade students' papers without knowledge of their identity. Knowing who wrote the response often biases the scoring.

k.   Content should be scored, not grammar, punctuation, spelling or penmanship (unless specified in the objective). Students may use poor grammar, punctuation, or spelling or have poor penmanship in writing their responses. These factors should not bias scoring of the response. The scorer should be reminded that it is knowledge that is being tested - not these other factors.

Listing

a. The directions should specify the number of things to be listed (if appropriate for the objective. and if the number of things is not a clue). If scoring will be on the bases of a specific length list, learners will be more likely to correctly answer the question if they know the length of the list expected.

b. The directions should indicate how the item will be scored without giving cues to the correct answer. Students should know if they must list items in a certain order, if they must use the exact words or presentation given in the generality, and/or if some parts of the list will receive more weight when scored. They should not, however, be given any information which will allow them to generate part or all of the list from reading the directions alone.

c. If order is important, the scoring key should treat sequence separately. If sequence is not judged separately from completeness, then one thing out of order could result in no credit for an answer which is complete, but out of sequence.

d. The scoring key should identify allowable synonyms or alternatives. Learners should not be penalized for having different wordings of the correct answer unless exact answers are necessary and called for in the directions. Any acceptable alternatives should always be included in the scoring key.

e. Spelling should not be scored unless required be the objective. (See Criterion "k." under Short Answer.)

f. The scoring key should identify relative weights of different items on the list, if appropriate. Most listing items will give equal weight to each item on the list. If some parts of the list will recieve more weight than others, this should be made clear in the scoring key and also in the directions.

Performance

a. The test should score all aspects of task performance and qualities of the resulting task product that are specified in the objective and no others. A performance item will assess either task performance or the qualities of the resulting task product. A product is a tangible result that you can touch, see, smell, and/or hear following an activity by students. A performance is a sequence or set of actions that students do that must be observed in action because the behavior itself is the final result of interest.

The following is an objective which requires evaluation of student performance:

> Given an emergency procedure simulator and a cue from the instructor that there is a partial failure of your parachute (Model 222), correctly execute the emergency procedure for overcoming such a failure within five seconds.

Here is an objective requiring evaluation of a product:

> Given an NBC 3 (Nuclear) report, 1:50,000 FORCHHEIM Map Sheet, overlay paper, grease pencils, a coordinate scale, and FM 3-22, plot a detailed fallout prediction with:
>
> 1. All coordinates and marginal information corresponding to the information given in the report.
>
> 2. The radial lines drawn to within $\pm$ 2 degrees.
>
> 3. The time of arrival lines, Zone I and Zone II downwind distances, and cloud radius corresponding to line ZULU of the report.

When objectives appear that cannot be classified, the objective probably needs improvement and lacks sufficient conditions, standards, or behavioral terminology to help you identify what type of measurement is needed. If the statement of the objectives is not clear, go to a subject matter expert or the author of the statement and ask "Are you interested in how the student does this (performance), or in a result (product) that is produced?" Thus, in many instances you cannot identify the appropriate test format until the statement of the objective is improved.

> b. The directions should clearly explain what the student is to do and how the item will be scored (and/or the test administrator should clearly communicate that to the student. An adequate performance item:
>
> 1. Provides sufficient information.
>
>   If the wording is such that the learner cannot figure out what he or she is supposed to do, the learner will be unable to perform the task.
>
> 2. Matches the objective.
>
>   Well-written behavioral objectives usually specify the behavior or task the student is to perform, the conditions under which the student is to perform that task, and the criterion for acceptable performance. A well-written performance test item should match each of these components as they are stated in the objective. For example, if the objective states that

The student will add with 100 percent
accuracy, and without the aid of a
calculator, two columns of four, two-
digit numbers.

then the test item might look like this:

Add both these columns of numbers.
(Note: you may not use a calculator.)

32	87
86	55
43	68
94	72

Even if the behavior or task were the same as that stated
in the objective, the test item would not be considered
adequate if the statement concerning nonusage of the
calculator was not present.

3. States the required behavior unambiguously.

The behavior stated in an objective should reflect that
behavior or task expected of the learner after completing
a segment of instruction. For example, identify, classify,
add, and subtract are such behaviors. Unfortunately, these
behaviors are also impossible to observe. They can all be
done without any accompanying overt act signaling that
they have taken place. We have all experienced
identifying a particular object or phenomenon without
exclaiming that we have done so. Though it is acceptable
in everyday living not to be provided with constant
indications of our mental prowess, it is not acceptable in
the case of performance measurement. Therefore, along
with each of these covert behaviors must appear another
behavior which describes how each covert behavior will
represent itself. For example, an objective may state

> Without the aid of any resource
> material, identify cats with 100 percent
> accuracy by pointing to all those
> appearing in a field of fifty animals.

As a consequence of instruction related to this objective,
we would like for the student to be able to identify cats.
The student will indicate to us whether or not he or she
can identify cats by pointing to them.

In writing performance test items, if the primary behavior (e.g., identify, classify, add, etc.) in the objective is specified alone and is not of an observable nature, the test-item writer can specify any means by which the student must show ability to perform the priamry behavior. If both a primary and a secondary behavior (e.g., in writing, orally, pointing, etc.) are specified, then the item in the objective must be employed in writing the test item. If the objective only specifies a secondary behavior, then the test developer should make every effort to secure information concerning the primary behavior in order to insure that the item to be written will clearly indicate the student's ability to perform that primary behavior.

Finally, both primary and secondary behaviors should be clearly specified in the test item.

4.   Provides the conditions.

The conditions under which the behaviors will occur must be clearly provided and accompany each test item. Conditions may take the form of problems to be solved by the learner. They should be provided along with the stem of the test item. In some cases, however, conditions will indicate under what circumstances, or provided with what additional tool, the learner is expected to perform. This statement of conditions is for the benefit of the test administrator who must insure that these conditions (e.g., with the aid of a calculator, given a tennis racket, etc.) stated in the objective (and test item) exist at the time of testing.

5.   States the criterion.

The criterion must be clearly stated for the benefit of the student as well as the test grader or interpreter. The student should be informed of how well he or she will need to perform a given task before being asked to perform it. This diminishes the possibility of any misunderstanding on the part of the student or the instructor as to how well the student needs to perform in order to be considered mastering the task.

c.   Each step (in a checklist) should be self-explantory to anyone who would perform the task. You might give the checklist to a beginning trainee and ask him to go through the performance step by step. If the checklist is well-constructed he should understand the steps and directions. Some items in the checklist will not be able to be performed without some teaching. You might have available a manual that describes in detail how to carry out a particular item.

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You could also give the checklist to a third party and ask him to judge the performance of a skilled expert. Ask that person to judge (1) when a step is completed or not, and (2) whether each step is completed correctly. Emphasize that the checklist, not the performer, is on trial. This process should help to identify those words or phrases that are unclear in the checklist.

d.   Each step (on a checklist) should be stated as a single action; important or complex decisions should be presented as single steps. Stating the steps as single actions makes it easier to insure that they are performed correctly and that portions of a step are not overlooked. Sometimes, however, a series of steps which the learner already knows or which are taught elsewhere can be grouped and referred to in a single step. If not, the steps must be stated as substeps to the main step on the checklist. In addition, if steps are performed simultaneously, they may be combined into a single step.

In listing the steps on a checklist, it is easy to overlook those steps which require some mental activity and include only those actions which are easily observed. However, it is important to the learner that any important or complex decisions be listed as separate and distinct steps. In some instances, the decision step leads to alternate paths in a procedure. For example, a decision step might be "Determine if the patient is in shock." Later, the checklist might state "If in shock, keep patient quiet; if not, have patient move to cover."

e.   The scoring key should specify all criteria the performance must meet, such as completeness, accuracy, quality, time limit, rate, etc. The scoring key should specify the same criteria for minimally acceptable task performance that were contained in the training objective. These standards may consist of:

   1.   Time/speed, if it is essential that a task be performed at or within a specified time, for a particular duration, or at a specified rate of speed (e.g., within 5 seconds).

   2.   Accuracy/error rate, if precise numerical measurements can be made of the accuracy of task performance (other than tolerance limits) or of the permissable number of errors (e.g., 8 out of 10 correct).

   3.   Adherence to authority or established procedure, if a publication, manual, or regulation explicitly describes the proper procedure the student must execute, and that is to be the performance standard (e.g., in accordance with FM 21-41).

   4.   Performance Precision. When a performance can be executed within an acceptable tolerance range or limit

which can be readily measured, the range of variation should be noted (e.g., within $\pm 5^{0}$).

5. Conformity with quality specification. When performance cannot be precisely measured, expert judgment is often used to assess the quality of the performance or final product. When qualitative criteria can be specified, they should be noted (e.g., a correct description will include . . .).

6. Computational accuracy. If the task is of a computational nature, acceptable limits should be noted within which the answer will be accepted as correct (e.g., gross weight calculated within 50 pounds).

7. Safety considerations, if a specific safety consideration must be complied with (e.g., without radiation hazard to personnel).

8. Completion cues, if the criterion for correct task performance is the creation of a specific condition or product (e.g., to arrive at the landing platform on a 10 foot hover).

f. If steps in the performance are scored, a checklist should be provided. Checklists should be the method of choice for performance evaluation when a set or sequence of observable behaviors in a performance or product must be examined.

A checklist is literally a list of behaviors that can be checked by an observer. It can be a simple list of a few sequential and related elements or a complex observational system involving precise behavioral definitions for each element. In either case, it is crucial that checklists be developed from a job analysis and field tested with actual students.

g. Any rating scales should be specific enough so that all raters will interpret them in much the same manner. Rating scales often involve abstract qualities. In these cases, the scale is created and labeled with words such as originality, durability, etc. These terms may vary in meaning between raters. The problem again is one of definition. Any time we deal with an abstraction, it is the responsibility of the instructor or designer of instruction to clarify the standards and objectives. The following is an example to illustrate the distinction between clearly stated traits and those that are less clear.

Bad Example: Rate the originality expressed in the following photographs.

Better: Rate the originality in the following photographs. Originality is defined as (1) use of a wide range of

tones, (2) nonsymmetrical composition,
and (3) realism. Each will be explained
in detail.

h. All raters should agree on the quality of task performance.
Lack of agreement among raters is a problem most Americans
have observed in viewing the Olympic Games in gymnastic and
diving competition. Different experts may often disagree about
the quality of performances, and sometimes there may be lack of
agreement for a single rater viewing the same people on several
different occasions. One of the most effective ways to
overcome this problem is to clearly define the objectives of the
performance. If the qualities of the performance to be rated
are well defined, raters will converge in their judgments and
ratings will be reliable. Another preventive action is to train
raters before they start rating. If there is lack of agreement,
the training session should focus on problem raters or the process
of rating as a whole.

5.3.9 Checklists Not Used (Question 18).

Checklists were appropriate for scoring task performance, but were not used
by the examiners. It is assumed that the checklist meets the criteria for
adequacy is defined in the Performance section of the Recommendations for
Question 17. If it does not, then the checklist needs to be redesigned. The
examiner should use the checklist. If he or she feels that the checklist is
inaccurate or unusable, then he or she should take steps to have it modified.
The solution to an inadequate checklist is not just to stop using it. If the
examiner has difficulty following the checklist because he or she has not be
trained in its use, a training session should be immediately scheduled.

5.3.10 Some Correct Answer Positions Used Too Frequently (Question 19).

On a selected response test (true-false, multiple choice, or matching) some
correct answer positions (e.g., a, b, c, or d) were used more than others. If,
for example, it becomes obvious to the test takers that the instructor has a
tendency to make "d" the correct answer to multiple choice questions, they
will select "d" when the do not know the anwer. This could artificially
inflate their scores. If this problem is discovered, recommend to the
instructor that correct answer positions be used about equally often.

5.3.11 Correct Answer Positions Form Repetitive Pattern (Question 20).

On selected response tests (true-false, multiple choice, or matching) specific
patterns of correct answer positions are repeated across test items (e.g., c, d,
a, b, c, d, a, b, etc.) or single positions are repeated in blocks (e.g., c, c, c,
c, d, d, d, d, etc.). This can give students clues that make the test easier
than it should be. If this problem is discovered, recommend to the test
developer that the answer positions be randomly assigned so that no pattern
can be discerned.

5.4 TESTING: Test Realism

THE PROBLEM. The test did not accurately reflect, as closely as possible, the requirements and conditions of the job. The test, of course, is directly related to the training objectives. The training objectives, however, should specify the tasks and conditions in such a manner that the job requirements are reproduced as accurately as possible within the training environment. Such training objectives will guarantee job related testing so long as the test follows the objectives closely.

EVIDENCE for a lack of test realism will come from Worksheets C1.4 Observation of a Performance Test, and C1.5 Observation of a Written Test.

> Question 10. Does the test item provide opportunities for COMMON ERRORS to be made?

> Question 24. Does the FINAL TEST integrate tasks as they are integrated in the "real world?"

> Question 25. Are tasks and task steps tested in the same sequence as they are performed in the "real world?"

RECOMMENDATIONS for training program modification.

5.4.1 Opportunities Not Provided for Common Errors To Be Made On Test (Question 10).

Possible responses to the test item did not allow students to choose or commit most errors common in the real job task. Test items should be written so as to permit students to make common errors. For example, the wrong answers (called detractors or foils) on multiple-choice tests should reflect typical student misconceptions. Performance tests should not be constrained so as to preclude students making common mistakes (see also TESTING: Contamination).

Identification of common errors often requires consultation with a subject matter expert. His familiarity with the task or objective should enable him to think of the common mistakes which trainees make when performing the task or the behavior required by the objective. If, for example, the objective involves applying a rule, common mistakes might involve things like:

1. Confusing one type of data with another (e.g., mixing similar symbols, "C" or "Cl" in chemical formulas).

2. Confusing the operations involved in using the rule (e.g., adding instead of subtracting).

3. Misreading tables or other presentations of the data (e.g., taking information from the wrong column or row in a table, etc.).

4. Being unable to use difficult forms of data (e.g., numbers in fraction, large decimal, or square root form).

5.   Making computational errors (e.g., misplacing decimals or making common multiplication errors).

5.4.2 Test Requirements Differ from Job Requirements (Question 24).

The final test did not integrate tasks as they are integrated in the real world. The test should, as closely as possible, measure performance as it would occur under actual job conditions and should require trainees to perform tasks together that would be performed together on the job. This says that the test should approximate job requirements. The extent to which this can be done may be limited by resource constraints, but such constraints can often be overcome with a little ingenuity. Talk with the training observers to find out why they rated Question 24 a "2" or "3." Take their observations to the training developer to see if a more realistic test can be developed.

5.4.3 Tasks or Task Steps Tested Out of Sequence (Question 25).

The test did not require trainees to perform tasks or task steps on the same sequence as they are performed in the real world. Steps for a procedure, for example, should be tested in the same order in which they were presented and practiced. This should be the exact order in which they are best performed. On rare occasions the order of certain steps within a procedure may be optional, and should be indicated as such on the check list.

5.5   TESTING: Contamination

THE PROBLEM. Trainees received help during the test in the form of hints, prompts, or cues from the examiner. The test should be a measure of how well trainees can perform tasks without any help from outside sources. The trainees should be on their own during the test and each trainee should receive exactly the same test.

EVIDENCE for contamination in test scores will come from the following work sheets:

   C1.4   Observation of a Performance Test

   C1.5   Observation of a Written Test

   C1.6   Observation of an Oral Test

   Question 26. Is the test free of external cues and help?

RECOMMENDATIONS for training program modification.

5.5.1   Trainees Got Help From Examiners (Question 26).

That trainees should not get help from the examiners seems obvious, but it happens. Examiners are not always committed to rigorous measurement of trainee performance. If rigorous measurement is not required by training management personnel, it will not be exercised by test examiners. If examiners are also the trainers, they will probably not be able to be rigorous testers because of "leniency bias." If examiners are not rewarded for rigorous testing (they may even be punished if too many trainees fail), they will not be strict in their interpretation of their role. If trainees are getting help from examiners, you will have to find out why the examiners are doing this. If they do not realize what they are doing, they need training in test administration. If the problem lies with the attitudes of training management, you can try to solve this at the next higher level in the chain of command if that is feasible from your position. If you work for the training manager, you may be stuck on this one. You would tailor the correction to the reason.

Appendix A

TEE QUESTIONS

1. Is the TEST FORMAT appropriate   (See table in job aid.)
   for the OBJECTIVE?

2. Are there test items for the TLO   1 = Test items for TLO or all
   or all of its critical parts/LOs?   parts/LOs
   (See job aid for critical parts.)   2 = No test items for TLO and
                                              for some parts/LOs
                                         3 = No test items for TLO and
                                              for most parts/LOs

3. Is there a test item for each   1 = Items for all parts
   critical part of each LO?   2 = Items for many, but not all parts
   (See job aid for critical parts.)   3 = Items for only a few parts or
                                              for no parts

4. Does the TASK LEVEL of the   (See table in job aid.)
   test item match the TASK LEVEL
   of its OBJECTIVE?

5. Does the content of the test item   1 = Same
   match the content of its   2 = Slightly different
   OBJECTIVE?   3 = Very different

6. Do the CONDITIONS of the test   1 = Exact match
   item match the CONDITIONS   2 = Minor mismatch
   of its OBJECTIVE?   3 = Severe mismatch

7. Do the STANDARDS of the test   1 = Exact match
   item match the STANDARDS of   2 = Minor mismatch
   its OBJECTIVE?   3 = Severe mismatch

8. For true-false, multiple choice,   1 = Only one answer is correct
   and matching items is only one   3 = More than one answer can be
   answer correct?   correct

9. For short answer, fill-in, listing,   1 = All correct answers are in
   and performance items are all   answer key
   acceptable answers in the answer   3 = Some correct answers are not
   key?   in answer key

10. Does the test item provide   1 = Yes
    opportunities for COMMON   3 = No
    ERRORS to be made?

11. Is the language of the test item   1 = Easy
    easy for students to understand?   2 = Somewhat difficult
                                         3 = Very difficult

12. Is the test item different from   1 = Different
    previous PRACTICE and   2 = Presented before, USE-UNAIDED
    EXAMPLES? (USE-CONCEPT,   3 = Presented before, USE-AIDED
    USE-RULE, or
    USE-PRINCIPLE only)

13. Is the answer to the test item given away by other item(s)?

1 = Answer not given away
2 = Other items give clues
3 = Answer can be found in other item(s)

14. Is the answer to the test item dependent on answering previous item(s) correctly?

1 = Answer not dependent on other items
3 = Previous items must be correctly answered

15. Are sketches and diagrams used in the test item easy to understand?

1 = Easy to understand
2 = Somewhat confusing
3 = Very confusing

16. Is the test item tricky or misleading?

1 = Not misleading
2 = Somewhat misleading
3 = Very misleading

17. Is the test item well constructed? (See job aid for criteria list for the test format used.)

1 = Meets all criteria
2 = Deficient on noncritical criteria
3 = Deficient on critical criteria

18. When performance steps are scored, does the instructor use a checklist?

1 = Fills in completely
2 = Uses as a reference or fills in partially
3 = Does not use

19. Is each correct answer position used about the same number of times? (true-false, multiple choice, or matching items only)

1 = Yes
3 = No

20. Are specific patterns of correct answer positions repeated across test items or are single positions repeated in blocks? (true-false, multiple choice, or matching items only)

1 = No patterns easily seen
3 = Patterns can be seen

21. Are test administration directions complete?

1 = Directions are complete
2 = Directions provided, but incomplete or unclear
3 = Directions are not provided

22. Do instructors follow the directions when administering the test?

1 = Yes
2 = Some variations from directions
3 = Significant variations from directions

23. Are adequate test instructions provided to the student?

1 = Yes
2 = Instructions provided, but unclear
3 = No instructions provided

A-3

24. Does the FINAL TEST integrate tasks as they are integrated in the "real world?"

1 = Yes
2 = Partially
3 = No, tasks are tested separately

25. Are tasks and task steps tested in the same sequence as they are performed in the "real world?"

1 = Yes
2 = Slightly out of sequence
3 = Very different sequence

26. In the test free of external cues or help?

1 = Yes
2 = Hints given
3 = Answers are given away

27. Are motivational techniques employed?

1 = Yes
3 = No

28. Is the trainee attitude positive?

1 = Positive
2 = Indifferent
3 = Hostile or frustrated

29. Are course ENTRY SKILLS reviewed?

1 = Review with practice
2 = Review with no practice
3 = No review

30. Is mastery of prerequisite skills verified prior to new instructions?

1 = Yes
3 = No

31. Are OBJECTIVES presented to the student?

1 = Yes
3 = No

32. Are the basic PRÈSENTATION COMPONENTS present?

(See guidance and tables in handbook.)

33. Are STATEMENTS complete? ·

1 = STATEMENT complete
2 = Few parts missing
3 = Many parts missing

34. Are STATEMENTS for CONCEPTS, PROCEDURES, or RULES adequate? (See job aid criteria.)

1 = Completely adequate
3 = Some or all features omitted

35. Does STATEMENT HELP provide sufficient explanation?

1 = Help provides sufficient explanation
2 = Help gives insufficient explanation
3 = Help is confusing

36. Does training include instruction on the use of required job performance aids?

1 = Yes
3 = No

37. Are EXAMPLES and NON-EXAMPLES adequate?

1 = Yes
3 = No

38. Is EXAMPLE HELP adequate?

1 = Help provides sufficient explanation
2 = Help gives insufficient explanation
3 = Help is confusing

39. Are EXAMPLES sequences from easy to hard? (CONCEPTS only)

1 = Yes
3 = No

40. Are there enough EXAMPLES? (See job aid for criteria.)

1 = Yes
3 = No

41. Are NON-EXAMPLES included? (CONCEPTS only)

1 = Yes
3 = No

42. Do DEMONSTRATIONS show how to correct/avoid common errors?

1 = Yes
3 = No

43. Are steps in a DEMONSTRATION the appropriate size? (See job aid.)

1 = Yes
2 = Step size is too small
3 = Step size is too large

44. Are tasks and task steps DEMONSTRATED in the same sequences as they are performed in the "real world?"

1 = Yes
2 = Slightly out of sequence
3 = Very different sequence

45. Are memory aids used? (PRACTICE REMEMBERING only)

1 = Used
3 = Not Used

46. Does each PRACTICE REMEMBERING have the same content and format as the test item?

1 = Same
2 = Same content, different format
3 = Different content

47. Are PRACTICE USING items sequenced from easy to hard?

1 = Yes
3 = No

48. Do PRACTICE USING items provide opportunities for COMMON ERRORS to be made?

1 = Yes
3 = No

49. Are PRACTICE items different from EXAMPLES? (USE-CONCEPT, USE-RULE, or USE-PRINCIPLE only)

1 = Different
3 = Presented before

50. Does PRACTICE USING integrate tasks as they are integrated in the "real world?"

1 = Yes
2 = Partially
3 = No, tasks are practiced separately

51. Are job performance aids (JPAs) usable? (See criteria in job aid.)

1 = Easy to use
2 = Hard to use
3 = Unusable

52. Do all students use the job performance aid (JPA)?

1 = Yes
2 = Up to 20% do not use JPA
3 = More than 20% do not use JPA

53. Does the TASK LEVEL of the PRACTICE item match that of the test item(s)?

1 = Yes
(2 and 3 — See table in job aid.)

54. Does the CONTENT TYPE of the PRACTICE item match that of the test item(s)?

1 - Yes
3 = No

55. Does the FORMAT of the PRACTICE item match that of the test item(s)?

1 = Yes
(2 and 3 — See table in job aid.)

56. Do the CONDITIONS of each FINAL PRACTICE item match those of the test item(s)?

1 = Yes
2 = Slightly different
3 = Very different

57. Do the STANDARD of each FINAL PRACTICE item match those of the test item(s)?

1 = Yes
2 = Slightly different
3 = Very different

58. Is FINAL PRACTICE free of external cues or help?

1 = Yes
2 = Hints given
3 = Answers are given away

59. Are there PRACTICE items for each TLO or all of its critical parts/LOs?

1 = PRACTICE items for the TLO or all parts/LOs
2 = No PRACTICE items for the TLO and for some parts/LOs
3 = No PRACTICE items for the TLO and for most parts/LOs

60. Is there a PRACTICE items for each critical part of each LO? (See job ; ' for critical parts.)

1 = PRACTICE for all parts
2 = PRACTICE for many, but not all parts
3 = PRACTICE for only a few parts or for no parts

61. Do all students PRACTICE?

1 = Yes
2 = Up to 20% of students do not PRACTICE
3 = More than 20% of the students do not PRACTICE

62. Do all students meet the required STANDARDS in FINAL PRACTICE?

1 = Yes
2 = Up to 20% of students do not
3 = More than 20% of students do not

63. Is FEEDBACK provided for PRACTICE?

1 = FEEDBACK HELP is given
2 = Correct answer only is given
3 = No feedback is given

64. Is FEEDBACK HELP adequate?

1 = Help gives enough explanation
2 = Help gives insufficient explanation
3 = Help is confusing

65. Is TEAM PRACTICE provided?

1 = Yes
3 = No

66. Are TEAM PRACTICE CONDITIONS the same as (or as close as possible to) those of the real task?

1 = Yes
2 = Slightly different
3 = Very different

67. Is TEAM PRACTICE FEEDBACK provided?

1 = FEEDBACK HELP is given
2 = Success/Failure feedback only is given
3 = No feedback is given

68. Is FEEDBACK HELP for TEAM PRACTICE adequate?

1 = Help gives enough explanation
2 = Help gives insufficient explanation
3 = Help is confusing

69. Are all PRESENTATION COMPONENTS separated and identified?

1 = Yes
2 = Some are not
3 = Most or all are not

70. Is the technical quality of written or spoken material adequate? (See job aid for criteria. Make notes on specific problems.)

1 = Most criteria met
2 = Several criteria not met
3 = Few criteria met

71. Is the wording of written or spoken material easy for the students to understand?

1 = Yes, few hard words and long sentences
2 = Some hard words and long sentences
3 = Many hard words and long sentences

72. Is the instructor's presentation or the narration easy to listen to?

1 = Yes
2 = Dull and monotonous
3 = Hard to listen to

73. Is the instructor's presentation or the narration supported by visuals?

1 = Completely
2 = Partially
3 = Not at all

74. Are visuals easily understood?

1 = Yes
2 = Understandable with effort
3 = Very hard to understand

75. Are the OBJECTIVES (TLOs and LOs) within each LESSON sequenced properly? (Prerequisites taught first.)

1 = Yes
3 = No

76. Are the LESSONS sequenced properly within the course?

1 = Yes
3 = No

77. Are the media appropriate for the objectives? (See table in job aid.)

1 = Yes
3 = No (note key words, underlined in table, on worksheet.)

78. Can the media used provide all necesary stimuli?

1 = Yes
3 = No

79. Are the course administration directions complete?

1 = Yes
2 = Partially incomplete
3 = Incomplete or non-existent

80. Do course administration directions make realistic demands of students and instructors?

1 = All demands are realistic
3 = Some demands are unrealistic (Note what they are.)

81. Is the instructor/trainee ratio such that all students can see, hear, and receive feedback?

1 = Yes
2 = A few students cannot see, hear, and receive feedback
3 = Many students cannot see, hear, and receive feedback

82. Does the instructor follow the methods in the Instructor Guide?

1 = Yes
2 = Follows to some extent
3 = Follows very little or not at all

83. Does the instructor teach all of the content in the LESSON materials?

1 = Yes
2 = Much of the content
3 = Very little of the content (If 2 or 3, note what was left out.)

84. Did the instructor limit his teaching to the content in the LESSON materials?

1 = Yes
3 = No (Please note what other things he taught.)

85. Is there enough space for all
    of the trainees?

1 = Yes
2 = A little crowded
3 = Very cramped or some
    students can't fit in the
    space at all

86. Is instruction free of
    distractions?

1 = Yes
2 = Distractions are annoying
3 = Distractions seriously
    interfere with the
    instruction

87. Is the lighting appropriate for
    the training situation?

1 = Yes
2 = Students have trouble
    reading or seeing displays
    & equipment
3 = Students cannot read or see
    displays & equipment

88. Is the temperature appropriate
    for the training situation?

1 = Yes
2 = Temperature makes students
    uncomfortable
3 = Temperature seriously
    interferes with learning

89. Is the instructor's attitude
    positive?

1 = Yes
3 = No

90. Are frequent breaks provided?
    (5-10 minute breaks every hour)

1 = Yes
2 = Breaks too short or
    infrequent
3 = Breaks not provided

91. Is the speed of presentation
    appropriate?

1 = Yes
2 = Too slow
3 = Too fast

92. Was the allotted training time
    too long or too short?

1 = Appropriate length
2 = Too long
3 = Too short

93. Does the training device/
    equipment used in training
    function properly?

1 = yes
2 = Minor malfunctions, little
    change from intended task
    performance
3 = Major malfunctions, substantial
    change from intended task
    performance

94. Is there anything else unusual about the LESSON materials, or do any other
    critical incidents occur during training that would interfere with learning?
    (Describe each one below. Rating = 3)

Appendix B

MEDIA DEFINITIONS

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1.   <u>Audio</u>. Equipment which delivers a pre-recorded audio message, which may be amplified for groups. The device involved may also have recording capability. Audio systems include audio tape systems, either cassette or reel-to-reel; stylus- or laser-read disc systems; and computer-generated audio.

2.   <u>Chart</u>. A flat surface for presenting displays to a class, containing messages in print, handwriting, drawings, pictures, graphs, or other forms. A blackboard is included in the chart category.

3.   <u>Computer</u>. The computer displays printed words, symbols, and diagrams, and may accept keyboard, light pen, or touch inputs as student responses. Suitably programmed, it can provide instruction adapted to the individual student's state of knowledge, display corrective feedback, and perform other adaptive and interactive operations. New varieties of instructional use are foreseen as auditory inputs and outputs become available.

4.   <u>Filmstrip</u>. Projection of pictures which are sequentially printed on a strip of film. Such projection may or may not be synchronized with an audio message from a tape player. The function of this equipment is the same as that of slide projection, with and without synchronized audio. It is, however, a separate medium, because it requires different materials and equipment and cannot be readily re-sequenced as slides can.

5.   <u>Instructor</u>. As a source of instruction, the most versatile medium is an instructor. Four important functions of an instructor are: (a) delivery of audio messages, (b) directing individual student attention to particular features of a display; and (c) human modeling, by serving as a model for choices of personal action; and (d) providing corrective feedback to the individual student. Types of individuals that could fall into this category would be instructors, who can perform any of these functions, and <u>assistant instructors</u>, who typically perform limited functions, such as providing feedback.

6.   <u>Interactive TV</u>. This medium combines a microcomputer with videodisc or videotape playback equipment. An interactive TV program, with sound, can become a highly useful "teaching machine" since its branching capabilities can provide feedback tailored to the individual student. It is different from a computer in that it can display motion-visuals and realistic still-visuals.

7.   <u>Large Equipment</u>. Operating equipment that is large and non-portable, such as a helicopter, truck, or artillery piece.

8.   <u>Motion Picture</u>. A film projection system displaying moving pictures on a screen, often accompanied by a synchronized audio track. Some systems permit large screen projection to large groups. Systems in this medium include 8mm projector systems (either regular or super 8), as well as 16mm and 35mm systems. Included in this category are both sound and silent projection systems although the latter is infrequently used.

9. Overhead Projection. Projection of transparencies (about 8 by 10 inches) displaying print, pictures, or diagrams onto a nearby screen. Overhead projection and the changing of transparencies may be done by the instructor at the front of a classroom or by using rear-screen projection. This category also includes the opaque projector.

10. Portable Equipment. A unitary device (rifle, protective mask), or a component of a real system (dial, carburetor), which is small enough to be readily lifted and transported. Portable equipment is often the medium of choice whenever direct practice of task performance is possible and desirable. Such equipment may sometimes have a specially built-in mechanism to provide corrective feedback to students, and thus may function in the manner of a training device.

11. Printed Text. Pages, cards, or other surfaces containing meaningful materials in printed form, for use by individual students. It is always possible for printed text to contain printed pictures or diagrams. Microfiche, microfilm, and other such reduced print media will be included in this category, even though they require additional equipment for their use.

12. Programmed Text. This medium is the basic form of programmed instruction, using printed cards or pages, usually collected into a booklet. A printed text (see item 11) takes on a programmed form when it requires frequent responses and provides feedback.

13. Simulator. Typically, equipment used for training or proficiency maintenance which reproduces many of the operating characteristics of the real equipment. An example is an aircraft flight simulator.

14. Slides. A medium without audio which projects still pictures from small slides onto a variety of possible screens, ranging from inches to yards across.

15. Slide/Tape. Projection of still pictures from small slides, accompanied by synchronoized audio-tape messages. This category may include a combined slide projector/audio tape system with automatic cueing or separate slide and audio tape machines with synchronization provided through direct human assistance. Slide/tape systems may involve more than one projector. Although the Bessler Cue-See can provide motion visuals, it is included in the slide/tape category because its typical use is closer to slide/tape than it is to motion pictures.

16. Training Aid. A surface layout, model, or mockup, providing a display of parts and processes of a system on which instruction is being given. The simplest form of a training aid is a chart. However, training aids may display part of real equipment (rather than pictures), and even provide dynamic views of processes (as in a working model of a hydraulic system).

    In contrast to training device (see item 17), a training aid makes no specific provision for corrective feedback to the student.

17. Training Device. Equipment on which mental skills procedures or motor skills can be practiced, and which provide corrective feedback to the student. (A training aid does not automatically provide corrective feedback.) A training device has its own operating principles and does not attempt to reproduce

those of the real equipment, as does a simulator. An example of a training device is a Link trainer.

18.   <u>TV Cassette</u>. A device which makes possible the display of a pre-recorded program (picture and sound) on a TV receiver. The device may also have a recording capability. Delivery systems covered by this category include reel-to-reel videotape systems, videocassette systems, and videodisc playback systems.