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OFFICE OF TRAINING

DIRECTIVE

COURSE: Instructor Training

SUBJECT: Methods of Instruction: Problem Solving HOURS: 2½

25X1A

METHOD OF PRESENTATION: Lecture & panel discussion INSTRUCTOR: [REDACTED] staff

OBJECTIVES OF INSTRUCTION: To establish the value of the problem solving method; to explain the steps in the preparation and use of "live" and field problems; to discuss the practical aspects of preparing and conducting problems.

SUMMARY OF PRESENTATION:

Document No.	1
No Change in Class.	<input checked="" type="checkbox"/>
<input type="checkbox"/> Declassified	
Class. Changed To:	TS S C
Auth:	HR 70-2
Date:	5 OCT 1978
	By: <i>22</i>

OUR WORKING COPY NO. 913

SUBJECTS WITH WHICH COORDINATION IS REQUIRED:

REFERENCES: 7-40.10/5c: Methods of Instruction: Problem Solving.

REMARKS: Training Aids: Vu-graph slide: Instructor's Role in Problem Solving.

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Instructor Training Course
Lesson Plan

Title : Methods of Instruction: Problem Solving

Objectives : To establish the value of the problem solving method
To explain the steps in the preparation and use of "live" and field problems
To discuss the practical aspects of preparing and conducting problems.

Reference : 7-40.10/5c, "Methods of Instruction: Problem Solving"

Training Aids: Vu-graph slide, "Instructor's Role in Problem Solving"

150 minutes

I. Presentation

A. Introduction

1. Give purpose of lesson
2. Explain conduct of lesson
 - a. 15 minute review of main points in study reference
 - b. 120 minute discussion of problems of preparing and conducting problems by a panel based as a topical outline and questions from class
 - c. 10 minute summary of discussion

5

B. Explanation

1. Review of reading material based on this outline
 - a. Principle of the problem-solving method - reference to lesson on, "Learning"
 - b. Major responsibilities of the instructor
 - c. Considerations required in the preparation of a problem
 - (1) Establishing the objectives or goals
 - (2) Analyzing the field situation
 - (3) Determining the training situation
 - (4) Constructing and conducting the problem
 - d. Kinds of problems used - comparison of the field and "live" problems

130

15

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2. Panel discussion of the practical aspects of preparing and conducting field and "live" problems based on this topical outline and questions from the class. 120 minutes

C. Summary

10

Total 150 minutes

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7-40,10/5c

METHODS OF INSTRUCTION: PROBLEM SOLVING

Problem solving is a teaching method which guides the student through a reasoning process necessary to the solution of a training problem. The training problems so used are of the most value when they create "real" or "live" problems similar to those likely to confront the student.

Although this method of instruction is outlined here for use as a separate technique for one unit of instruction, it may be used with other methods. Whenever this technique is to be used effectively, the requisites of preparation, conduct and critique apply.

It has been discussed previously that the development of attitudes and habits are as much proper objectives of a training program as the teaching of knowledge. This organization has a requirement of unusual importance in preparing individuals to accomplish missions where poor judgment or lack of careful observation of existing conditions often lead to disaster. Problem solving is a method of instruction which by example and its requirements, emphasizes the use of the reasoning process. To the degree that it teaches proper habits of analysis and thinking, it surpasses other methods of instruction.

Its disadvantages are found in the difficulty of its preparation, the requirements for equipment, instructors and space, and the lack of adequate, positive operational histories.

The general outlines of the method are the same as the five steps described in the "reasoning" or "thinking" process discussed in another reference. The instructor must realize his responsibility to the student in each of these steps in order to gain the greatest value from this instructional method.

1. Stating the problem.

The instructor's responsibility is to create problems built on anticipated "felt needs" or real difficulties of the students. The problem must be defined clearly for the student or he must be assisted in localizing it so that he will acquire the technique of analyzing situations which confront him.

2. Suggestions for possible solution.

In this step the student or student groups, independently or under the direction of the instructor, construct hypotheses. If the training problem is constructed properly these proposed solutions will arise from the subject matter, skills, and techniques which were taught previously. Here the instructor guides the student's thinking and activity principally by suggestion.

3. Testing the hypothesis.

In this phase the activity of the student is observed by the instructor for evidence that the student is finding and examining all of the factors and their relationships which influence the hypothesis and that he is planning to apply the principles which have been taught. The instructor must keep the student from getting too far afield in order that the desired learning will take place.

4. Evaluating the conclusion.

The completion of the problem affords the instructor the opportunity to review with his students both the success of their solution, the reasons for their actions, and the effectiveness of the problem solving technique which they applied.

Considerations Required in the Preparation of a Problem.

1. Establishing the objectives or goals.

Problem solving is an excellent tool of teaching for integrating techniques and other instruction which have been presented in an unrelated fashion. This applies especially to instruction involving coordinated individual or group actions such as tactical exercises and plans, and where evaluation of individual capacities for judgment and leadership is required. In initiating the planning of such problems the instructor must be very precise in establishing the objectives of the problem and in defining them clearly. For example, an objective might be to teach a small unit how to plan and ambush a motor convoy or to show the student the importance of establishing emergency communications. All objectives must be stated with relation to the general aims of the course. If the number of principles to be applied by the student is limited he is less likely to be distracted by tangential aspects of more complicated problems and the importance of the objectives taught will become more clearly fixed in his mind. It should follow that the problem presented is real, that is, it is likely to be encountered by the student in his future assignment. The entire framework and detail of the problem must relate only to those objectives and not involve extraneous techniques, knowledge, or skills unknown to the students.

2. Analyzing the field situation.

Having established the objectives of the problem to be presented to the students, the instructor must list in detail all the factors and requirements of that problem which would likely be present in a real situation. This is the research step. What do the case histories show to be the usual elements of the operational situation

which is to be duplicated under training conditions? Of these basic factors, which ones are variables due to local (i.e. specific area) differences? Once these factors have been determined and examined they should be arranged in the order and relationship they are most likely to have with each other. A simple listing of the major points will suffice for the instructor to re-determine whether or not the general framework of the operational-training situation will require the application of the basic principles, skills and techniques which he wants to teach through the problem.

3. Determining the training situation.

The next step in the problem preparation is to balance the capabilities of the training conditions with the requirements which the use of the problem will demand. Essentially this comparison will be made on three basic points:

a. Extent of realism required.

The greater the degree of realism achieved by the instructional situation, the more effective teaching is done by the problem. Even the more sophisticated student is affected by attempts at realism. However, training conditions in a problem situation cannot always duplicate those to be expected in a real situation. At this point the major facets of the situation and the degree to which they must be realistic to achieve the objectives of the problem must be determined.

b. Physical capabilities and time limitations.

In the ambush problem mentioned previously, certain details could not be "real" but must be duplicated to an extent determined by the capabilities of the training area as to equipment, terrain, personnel, and time. In part, they are:

1. Size, armament, personnel, route and time of travel of enemy convoy.
2. Personnel available for the ambush force.
3. Weapons and demolitions available.
4. Tactical situation.

The method of handling each of these factors in the training situation will vary from all factors being assumed in a safehouse problem to complete duplication of them on a field training site. Given as assumptions in the problem,

all the equipment, time and terrain necessary, plus designating certain map areas for the location of the ambush, would confine the student to selecting the site, planning and executing the physical details of the ambush and with drawing from the area. These constitute the major objectives of the problem.

c. State of training of students.

The operational situation chosen by the instructor may require the student to accomplish tasks not yet mastered or not relating directly to the principal skills or techniques to be taught by the problem. Obviously, if it is clear at this point that the students do not have sufficient training or mastery of the principal concepts and skills, the problem cannot be utilized. All incidentals which encumber the student or lend little to achieving the teaching objectives should be set aside and the student relieved of the responsibilities for them. This is done by providing them to the students as facts in the situation or by assuming the student's capability to do them. For example, for a given locale, the student of the ambush problem may not know what specific kinds of weapons would be available for his ambush plan. The instructor gives him a warehouse list from which he may select the appropriate weapons - the selection of proper weapons being one of the problem's objectives.

In any event, complete analysis of the training situation as it provides the capability of establishing the problem framework and the degree of realism which can be attained must be made in some systematic fashion. It is suggested that a simple columnar arrangement of requirements, capabilities and plans can be used as shown as Attachment A. The size of the sheet, extent of detail given and order of points listed will vary with instructors. A systematic approach to problem preparation will insure a complete, logically developed, closely controlled problem.

4. Problem.

The problem itself and the conduct of the problem may be considered from these four sub-topics:

- a. Initial situation.
- b. Controlling progress.
- c. Testing and evaluating students.
- d. Problem critique.

The initial situation establishes the setting within which or from which the problem will proceed in its development. The student or students must understand clearly what the situation is and where he, his group or team is to start. This explanation which establishes the characterizations and attitudes of the students and instructors is built by the use of briefing sheets, motion pictures, still pictures, and verbal presentations which describe the general and specific situations which will confront the student. The scope and depth of these materials vary according to the needs of the training problem and to the extent that realism of situation and characterization is desired. These materials are developed by the instructor with the greatest attention to what is to be read, seen, or heard by the students and the effect each fact or circumstance will have on the progress of the problem or the student's conduct. The specific situation confronting the student in the problem should leave no doubt as to the requirements for action that are placed on him.

The control of the problem as it progresses is maintained by the carefully designed initial staging and by the framework of the problem as it develops. The instructor must anticipate all the situations to be met by the students - the materials, activities, skills, and understandings demanded, and all the possible alternatives that might be chosen. Here again the instructor must review all possible influences and actions with relation to the teaching objectives of the lesson.

New elements may be introduced into the initial specific situation as the student progresses, or fails to progress, or as might logically be expected to develop in a field situation. As these situations unfold, some clearly mark themselves as the instructor's checkpoints on the student. These control points may be used to guide or re-direct the student if he is proceeding incorrectly or to stimulate a greater application of knowledge and skill by the more exceptional student. The instructor may find it necessary to provide the student or group with an acceptable solution of the problem through that phase so that the trainee may analyze his errors or poor judgments. In this manner the trainee will get the value of the instruction he did not complete successfully and will also be prepared to meet later phases of the problem. The instructor's best criterion at this point is: "By which course will the student learn more?" Often a thorough critique in early phases of the problem or after each problem stage, will achieve a great deal in keeping the objectives of the problem in front of the students.

Testing and evaluating the student and his performance demands that the instructor establish clearly for each phase of the problem and the problem as a whole, what he expects of the student in terms of the application of the principles being taught and the

personal qualities to be displayed. Problem solving is, perhaps, the best instructional method for evaluating students and their performance, as it requires more from the student than proficiencies in specific subject-matter and skills. It demands the integration of all special abilities, the exercise of reasoning and judgment by the trainee, and the display by the student of some intangible personal factors, such as initiative, leadership and imagination.

Students may be required to solve the problems, either orally, in writing, or by performance in several ways. This will depend upon the objectives of the problem, the type of problem (classroom vs. field types), training facilities and other factors. In general, these methods of organization can be used:

1. Individual solution
2. Group or team solution, which may be
 - a. by committees in which the entire group, working on the same requirements, arrive at a group solution, or
 - b. by teams. Each student works or performs that requirement, or part of a requirement, or team-member duty assigned him by the group leader.

Individual solutions are appropriate where it is imperative to evaluate each individual's performance and judgment on all aspects of the problem. Group or team solutions are appropriate where the individual is expected to master any of the tasks that may be assigned him or where qualities of leadership or "followership" are to be observed.

To accurately score what is observed, the instructor must establish standards of performance and must devise rapid means of recording what the student does. Check lists, written notes, sound recordings, still and motion pictures should be used to secure accurate observations which can later be discussed with the student. The general and specific framework of the problem, the statements and directions of the instructor and previous instruction should be presented so that the students have a clear understanding as to what is to be done by them and how well it is to be done.

The critique of the problem is a valuable instructional tool. It is the instructor's final opportunity to insure that the principles to be taught in the problem are understood by all students. Whatever method is used to conduct the final critique, it should recall the original framework and situation in the problem, analyze the "whys" and "hows" of student performance

in terms of the principles which were to be applied and explain them in detail against the possible solutions to the problem and the level of achievement that was required by the instructor. All possible solutions of the problem, or any of its phases, should be covered and evaluated.

The final critique may be conducted in several ways. If only one student or a very few are concerned, each solution should be compared with the other selections and examined critically. If a group is being instructed, whether its members executed the problem requirements individually or as a group, several methods of handling the critique are available to the instructor. As a general principle as many solutions as possible should be presented and reviewed. Since it is frequently impossible for each student or group to present a complete solution, maximum participation by the class can be achieved by any one or combination of these methods:

1. Have one solution presented, complete, and without commenting on it; have another presented which is also complete. Instructor then requires these two to indicate the reasons for points of difference.
2. Same as 1, but other groups or individuals are requested to comment on points of difference.
3. Same as 1, but one other group or individual is required to analyze the two solutions in terms of group's or individual's own solution.
4. Only one solution is presented, complete, and other groups or individuals indicate only those points in which their solutions differ from the one presented.
5. When the solution or action conveniently breaks into component steps or parts, it can be discussed step-by-step. A different individual or group is called upon to present each part. The instructor moderates each part in accordance with any of the previously stated methods. Care must be taken to establish correctly and clearly the analysis of each part before proceeding to the next.

The realism of the present tense (which should be used in writing the problem situation and maintained during its conduct) is carried over into all oral discussion. The instructor directs all discussions in a positive, realistic manner, speaking as though the situation were actual and at hand. Most discussion will follow automatically and in the same vein if the instructor creates a positive spirit and pace.

Kinds of Problems Used.

The kinds of problems (or problem-situations) used in the problem solving method of instruction are varied. Although the term "problem solving" may be applied to the performance of a single technique or single skill (these are more frequently called "exercises"), usually it pertains to those problem situations which require the students to integrate knowledge, skills and techniques into an action which will bring a solution to the problem. Several of these problem solving methods have proved of particular value for the kinds of training situations which confront instructors of this organization. They are the field problem, the "live" problem, the case study, and the "paper" problem. This discussion is concerned only with the first two kinds.

The basic concepts of use and the method of preparation are similar for the field and the "live" problem. For our consideration, field problem and "live" problem may be defined as follows:

1. Field problem.

This is a training situation in which the activities of the student or student group take place over terrain or at one site under simulated conditions closely comparable to those in the anticipated real situation. Although it may be used for individual training, usually the field problem emphasizes tactical, logistical and advanced technical training where teamwork among the individuals of a group is required.

2. "Live" problem.

This is so constructed as to confront the student with a simulated operational situation involving a complex of missions which require the student to apply operational concepts and techniques primarily through the principal personalities of the simulated operational situation as portrayed by the instructor(s) or other students. Although it is feasible to organize such a problem situation for group action, the "live" problem can be used more effectively if its requirements are for individual solution. Therefore it is particularly valuable for evaluating the personal characteristics of the student under simulated operational conditions.

A comparison of other factors concerning the preparation and use of these two kinds of problems serves to point out other considerations which the instructor must examine and plan before a problem can be used.

Latitude for Student Action.

Inasmuch as the terrain and tactical situation in the field problem will usually dictate the general outline of the student's

course of action, it may be said that field problems lend themselves more to the observation of the student's ability to apply special skills and techniques rather than to making some evaluation of his personal attributes. Operational judgments, leadership abilities and physical capabilities can be judged to a degree. However, the "live" problem provides opportunities for observing those capacities and additionally establishes a situation in which the student by the very nature of the simulated situation is given a greater choice of action and must evolve an acceptable relationship with the individuals whose characterizations confront him. Both of these elements are critical points of evaluation in our training program.

Briefing Materials.

The terrain over which the field problem is to proceed obviates to a great extent, the necessity for the development of much background information for both the student and the instructor. Obviously this is not true of the "live" problem situation where extensive explanatory materials are necessary in order to establish in detail realistic, simulated conditions, create the desired attitudes in the less imaginative students and provide the instructor with the greater breadth and depth of knowledge necessary to cope with all possibility of student action and unanticipated teaching opportunities. The student's briefing must contain a clear, concise statement of the situation - in terms of the number of written pages, it may be lengthy - all material or facts presented must be pertinent and not contain vague, uncertain or ambiguous situations or information which will confuse the student. The briefing must establish a definite assignment for the student - whatever the latitude of action or number of starting points may be. No student will be able to proceed successfully until he understands the background data and the assignment. The instructor's briefing sheet must contain all possibilities of action in the problem as well as the complete information used by the student. Particularly in the "live" problem, instructions must be clear to the instructors as to the reactions to be presented the student in response to various approaches.

Student Assignments.

Several general plans for assigning student responsibilities were described in another part of this paper. Regardless of the general method followed, a certain amount of written work should be required of the student. This achieves the following purposes:

1. Provides instructional checkpoints on the student's progress which can be used for scoring purposes; predicting the success or failure of future moves in the problem for instructional purposes, and of informing the student of his accomplishments to that point.
2. Ensures that the student becomes thoroughly familiar with the briefing material.

3. Provides a definite means of tabulating the student's application of previously taught concepts and specific skills.

Requirement for written work has equal application to field and "live" problems, if the paper work required is normally that which the individual would prepare in a field situation. This would be prepared in the form of plans to be submitted for review, coordination or approval, operational reports and pertinent support arrangements.

Scoring Student Performance.

In the "live" problem the instructor's opportunity for evaluation of the student's performance is limited by the concentration on his role to retain spontaneity in his performance. The instructor's lack of concentration on the student means he must devise other means of scoring the student accurately. Sound recordings, photographs and other graphic means have been suggested. Unobtrusive observation by another instructor is perhaps the ultimate. As in the field problem, performance check lists, carefully prepared in advanced as to what is to be observed and the standards of performance expected, can be used successfully if completed immediately after the action has been observed.

TAB

7-40.10/5c

Instructor Training Course

Lesson Plan

Title : Problem Solving

50 Minutes

Objectives : 1. To acquaint the student with problem solving as a method of instruction.
2. To present some techniques an instructor must consider in preparing and presenting a problem
3. To show the student how to construct a problem so that he can apply the techniques of problem solving to his instruction in the field

Reference : 7-40.10/5c, "Problem Solving" [REDACTED] pages 129-147, 176-195

Training Aids: Blackboard, Vu-graph, with transparencies, adequate copies, Problem Evaluation Sheet

STATINTL

I. Presentation

A. Introduction (Motivation)

5

1. Use of problem solving
 - a. Develops thinking within student
 - b. Situations can be developed so that student can use the reasoning process in order to arrive at a solution
 - c. Problems are used only when basic techniques and skills have been taught so that they may be employed in the solution of the problem
2. Since a great percentage of learning is by doing, problem solving allows the student to work on his own
3. This period will be an introduction to problem solving. The following hour will be an examination of a sample problem from an instructor's point of view. The remainder of the day will be in student preparation of a sample problem

B. Explanation

5

1. How we think (Reasoning Process)

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Minutes

- b. Define problem
- c. Pose a solution (hypothesis)
- d. Examine the solution
- e. Take action on solution

2. How the instructor makes use of the reasoning process

5

- a. States problem
- b. Suggests possible solutions
- c. Tests student's hypothesis
- d. Evaluates student's solution

NOTE: The material under C to be handed out to the students.
Directed discussion to follow.

C. Directed Discussion

20

1. Consideration required in preparation

a. Establish objectives

- (1) Will the objectives provide the student an opportunity to use previously taught knowledge skills and techniques in the pattern likely to be required by an operational situation
- (2) Are the objectives clearly defined so that the student realizes what is necessary for him to do or accomplish?
- (3) Are the objectives such which substantiate the use of the problem

b. Analyze the actual operational situation (realism)

- (1) Factors present in the situation
- (2) Capabilities required to meet these factors

c. Plan initial instructional situation and requirements

- (1) Revert to real elements determine importance against the stated objectives

NOTE: Show problem evaluation sheet and explain

- (2) Status of trainee skills relative to accomplishing elements and importance of each
- (3) Duplicate real elements either actually or by simulation

d. Conduct of problem

10

- (1) Control and check points
- (2) Testing student
- (3) Additional situations and requirements

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- e. Critique
- f. Administrative details

Minutes

5

(1) Mechanical and physical aspects of the problem should be well prepared:

- (a) Time and place to report
- (b) Uniform and equipment
- (c) Transportation and mess arrangements

(2) Terrain and area preparation

- (a) Safety devices
- (b) Communications
- (c) Targets
- (d) Obstacles
- (e) Effects necessary to simulate actual conditions

g. Rehearsal

Total Time

50

7-40.10/5e

METHODS OF INSTRUCTION: PROBLEM SOLVING

General. The most important goal of any instruction is to prepare the student to meet and solve the problems which confront him. This is referred to frequently as "teaching how to think" or "how to reason." However it may be defined, preparing the individual to organize and utilize all of his capacities in any situation is the final objective of instruction.

If the solution of problems constitutes one of the important aspects of human existence, then it may be profitable to review what psychologists believe is the "reasoning" or "thinking" process applied to these problems. This examination will show why it is necessary to give a large place in any instructional program to a method of teaching that will enable the individual to increase his ability to solve his problems.

The "reasoning" or "thinking" process.

- a. Psychologists agree that thinking starts with a problem or "felt difficulty." Whatever it is, it is a "problem," because the habitual ways of reacting to that situation have been unsatisfactory.
- b. The next requirement is that the existence of the problem be recognized, its nature defined clearly and concisely. Many people are only vaguely aware that a perplexity exists. They bring no frontal attack upon it, because they fail to see and define it clearly.
- c. Once the problem is defined, a possible solution or hypothesis must be formulated. This hypothesis is usually a mixture of what is known (experience and training) and those new meanings suggested by the imagination.
- d. Once a hypothesis is proposed, all of its factors are examined critically to appraise or assess their significance to that hypothesis. All possible consequences of the hypothesis are "thought over." A proposed solution found wanting must be cast aside and new ones formulated and examined until one is found that offers reasonable promise of success.
- e. Finally, we act on the proposed solution and the reasoned-out relationships. The results of the first experience in applying the solution may develop new problems or phases of this problem, heretofore unknown, which again, will require the application of the reasoning process.

The problem solving method. Problem solving is a teaching method which guides the trainee through the reasoning process necessary to the solution of a training problem. The training problems so used are of the most value when they create "real" or "live" problems similar to those likely to confront the trainee.

The general outlines of the method are the same as the five steps described in the "reasoning" or "thinking" process. The instructor, from the teaching standpoint, must realize his responsibility to the student in each of these

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steps, to gain the greatest value from this instructional method.

- a. Stating the problem. The instructor's responsibility here is to create problems built on anticipated "felt needs" or real difficulties of the students. The problem must be defined clearly for the student, or he must be assisted in localizing it so that he will acquire the technique of analyzing problems which confront him.
- b. Suggestions for possible solution. In this step, the student or student groups, independently, or under the direction of the instructor, construct hypotheses. If the problem is constructed properly, these proposed solutions will arise from the subject matter, skills, and techniques which were taught previously. Here the instructor guides the student's thinking and activity principally by suggestion.
- c. Testing the hypothesis. In this phase the activity of the student is observed by the instructor for evidence that the student is finding and examining all of the factors and their relationships which influence the hypothesis. Here, too, the instructor must keep the student from getting too far afield in order that the desired learning will take place.
- d. Evaluating the conclusion. The completion of the problem affords the instructor the opportunity to review with his students both the success of their solution, and the effectiveness of the problem-solving technique they applied.

Considerations required in the preparation of a problem.

- a. Establishing the objectives or goals. Problem solving is an excellent tool of teaching for integrating techniques and other instruction which has been presented in an unrelated fashion. This applies especially to instruction involving coordinated individual or group actions, such as tactical exercises and plans. In initiating the planning of such problems, the instructor must be very precise in establishing the objectives of the problem and in defining them clearly. For example, such an objective might be to teach a small unit how to plan and ambush a motor convoy or to show the student the importance of establishing emergency communications. (All objectives must be stated with relation to the general aims of the course.) It should follow that the problem presented is real, that is, it is likely to be encountered by the student in his future assignment. The entire framework and detail of the problem must relate only to these objectives and not involve extraneous techniques, knowledge, or skills unknown to the student.
- b. Selecting the elements of the problem. Having established the objectives of the problem to be presented to the students, the instructor must set down in detail all the factors and requirements of that problem which would likely be present in a real situation. Once these factors have been examined they should be arranged in the order and relationship they

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are most likely to have with each other. The instructor must re-determine that the problem leads to a solution or solutions consistent with the objective of the problem. All elements of the problem situation should produce actions on the part of the student or students which are directed toward that objective.

- c. Initiating the problem situation. Training conditions in a problem situation cannot always duplicate those to be expected in a real situation. In fact, it may be desirable not to attempt to duplicate all of the elements of the real situation. Some of them will require the student to accomplish tasks not yet mastered or not relating directly to the principle skills or techniques to be taught by the problem. The instructor must study the problem carefully and extract those items so that he may conserve the student's time by relieving the student of responsibility for them or for using them as additional control factors. In most instances, this can be done in establishing the setting or situation for the student or the group. The student must understand clearly what the situation is and where he, his group, or team is to start. Then conditions must be the same for all individuals or groups. At this point those real factors which cannot be duplicated in the training situation must be isolated from the problem-situation. Also such incidentals as will encumber the student, or lend little to the teaching of the techniques required by the objective, should be set aside. These aspects of the problem situation are prepared for the student by the instructor. These factors, in general, are the assumptions in the planning of the problem which start the student or group toward a solution. For example, in the "how to plan and ambush a motor convoy" illustration, these are the elements of that problem which may be given the groups in order to "set the stage"; they are real details which cannot be duplicated or which are not the basic skills required for the solution:

- (1) All information as to size, armament, personnel, route, and time of travel of the convoy.
- (2) The size of his force.
- (3) Weapons and demolitions available.
- (4) Location of ambusher restricted to map designated areas.
- (5) The tactical situation.

The students' energies in this instance will be confined to selecting the site, planning, executing the physical details of the ambush, and withdrawing from the area. These constitute the objective of the problem.

- d. Controlling the progress of the problem. The control of the problem as

it progresses is maintained by the carefully designed initial staging and by the framework of the problem as it develops. The instructor must anticipate all the situations to be met by the students, the materials, activities, skills, and understandings demanded, and all the possible alternatives that might be chosen by the student. Here again the instructor must review possible influences and actions with relation to the objective of the lesson. As these situations unfold, some clearly mark themselves as appropriate checkpoints for the instructor on the student. These control points may be used to guide or redirect the student if he is proceeding incorrectly. New elements may be introduced into the situation at the points to which the student must continue to apply the problem-solving technique. The instructor may find it necessary to provide the student or group with an acceptable solution of the problem through that phase so that the trainee may analyze his errors or poor judgments. In this manner the trainee will get the value of the instruction he did not complete successfully and will also be prepared to meet later phases of the problem.

- e. Testing and evaluating the student and his performance. Problem solving is, perhaps, the best instructional method for evaluating students and their performance, as it requires more from the student than proficiencies in specific subject-matter and skills. It demands the integration of all special abilities, the exercise of reasoning and judgment by the trainee and the display by the student of some intangible personal factors, such as leadership, initiative, and imagination. The instructional problem must indicate clearly what is to be evaluated during and at the conclusion of the problem. The instructor must set up evaluative criteria for each phase of the problem as well as for the whole problem. These should be stated clearly to the trainees in terms of what is to be done and how well it is to be done.
- f. Critique of the problem. The critique of a problem is a valuable instructional tool. Here the original framework and stage setting must be recalled and the ways and hows of student performance analyzed and explained against the possible solutions of the problems and the level of achievement required by the instructor. All possible solutions of the problem, or any of its phases, should be covered and evaluated. The problem must always be subject to modification after valid criticism. The instructor must be a student of his problem—showing a readiness to learn the deficiencies in his instruction and to adopt suggested techniques to insure a higher degree of instruction and reality.
- g. Mechanical and physical aspects of planning the problem. Ill-planned problems, of course, will result from a lack of thorough study and realization of the potentialities of available time, equipment and terrain. These are always considered in planning instruction.

Additional comments on instructor guidance in problem solving and suggested rules. Although the instructor may not appear to occupy the center of attention in some aspects of the problem method, he is an important cog in the machinery of this method. The tendency is to individualism in problem solution. Whatever the direct approach, the degree to which the instructor himself is a master of problem solving will bear a direct relation to the effectiveness of his direction of others in the process. An instructor who

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has the ability to see problems clearly, the power to analyze with discernment, and the faculty to synthesize and draw conclusions with accuracy will be a rare help to the students in their mastery of the difficult technique of problem attack. Guidance in problem solving is, in reality, training in how to study, and, it might be added, in how to think.

The following is a suggested list of rules which every instructor should study carefully as a guide in this task. It is well for the instructor to remember, however, that the order of rules will vary with the procedure used.

- a. Get the students to define the problem at issue and keep it clearly in mind.
- b. Get the students to recall as many related ideas as possible by encouraging them:
 - (1) To analyze the situation.
 - (2) To formulate definite hypotheses and to recall general rules or principles that may apply.
- c. Get the students to evaluate carefully each suggestion by encouraging them to maintain an attitude of unbiased, suspended judgment or conclusions.
- d. Get the students to organize their material so as to aid in the process of thinking by encouraging them:
 - (1) To take stock from time to time.
 - (2) To use methods of tabulation and graphic expression.
 - (3) To express concisely tentative conclusions reached from time to time during the inquiry.

Kinds of problems used. The kinds of problems (or problem-situations) used in the problem-solving method of instruction are as varied as there are training situations. Although the term problem solving may be applied to a single one-technique or single skill, usually it pertains to those problems which require the students to integrate knowledge, skills, and techniques into action which will bring a solution to the problem. Several of these problem-solving methods have proven of particular value for the kinds of training situations which will likely confront instructors of this organization. They are the case study, the live problem, the field problem, and the planning or "paper" problem.

- a. The case study. The case study problem is based on the student's

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analysis of an operational history especially prepared for instructional purposes. The case study must contain the essential factors in agreement with the objectives of the instructor. It may be treated in a positive or negative way, that is, in a way as to emphasize the successful operational procedure or to show operational errors and inconsistencies. The techniques of using the case study problem are many. It is essential that the student receive some guidance in his study and that what he does be carefully evaluated and critiqued by the instructor. Both may be done through written or verbal reviews and discussions.

- (1) Value and selection. The case study is valuable, for it presents a whole body of information—all the elements and their dynamic relationships. It must be chosen to fit the course and must have a specific place in the course. The general principles of selection for any problem must be considered. The lateral or by-products of the study must be determined so that they may be controlled.
 - (2) Preparation. As with all problems, the various uses of the case study must be planned before the details of the study can be organized. Portions must be emphasized, and others subordinated consistent with the needs and the objective of the lesson. The particular organization selected for the material must support these selections.
 - (3) Presentation. It is proposed that an effective means of presenting the case study, either in verbal or written form, is that of presenting a drama. Principally, this will include a list and description of the characters, or participants, an explanation of the scene or situation, a fixing of the time, and the introduction of the first character or personality whose activities affect the essentials of the study. As a rule, the chronology of the study should be progressive; however, it may be necessary to speed-up or slow-down certain times within the action for purposes of closer examination of detail or to eliminate unimportant periods. In many instances, operational elements or chronological events may be repeated or reappear for purposes of emphasis or continuity. In general, no critical or editorial comments should appear in the case study—only a recounting of the facts. When editorial or critical comments are required for clarity or for instructional purposes they should separate from the body of the case study. If complexity is avoided, the elements of the problem will be easily controlled and better aligned with the objective of the lesson.
- b. The live problem. The live problem is so constructed as to confront the student with a situation which requires the exercise of the mental and emotional processes of an actual operation. In such a problem the instructors and students assume the various characterizations required by the situation. It is particularly valuable as it may be used to evaluate the student as a person. Inasmuch as it should be an active exer-

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cise of other instruction, it provides an opportunity for the student to practice operational principles.

- (1) Preparation. The principles of problem construction must be applied carefully during the preparation of a live problem. The instructor must determine what is to be taught in the problem. Its elements should be those presented in the course or subject and evaluated as to their significance. As a matter of principle, the problem is a carefully constructed experiment in which all the factors are controlled except those to be taught and, of course, the student. Those factors which limit the activities of the student reduce the value of the problem. In restricting his freedom, these limiting factors channel his actions and thereby decrease the value of the assessment of the trainee.
 - (2) Presentation. The principles applying to the preparation of the student and the instructor for the problem are of great importance. The student's briefing must contain a clear, concise statement of the situation with a definite assignment for the student. No student will be able to proceed successfully until he understands both. The instructor's briefing sheet must contain all possibilities of action in the problem as well as the complete information used. Instructions must be clear to the instructors as to the reactions to be presented the student in response to various approaches. During the progress of the problem, the instructor must utilize the checkpoints established on the student. Realism is instilled by the instructor by adopting the attitudes and levels of conversation assigned to the characterization he is assuming.
 - (3) Critique. To unfold the critical steps of the problem point by point in the critique is an effective means of initiating the discussion of the problem. This provides an opportunity to review the possible action at those points and to analyze the factors of judgment supporting various actions. During the problem and at the critique some mechanical recording of the student's performance is helpful for the instructor's evaluation of the student. If recordings can not be made of the full discussions, the use of a check list is helpful. Again the problem critique is an opportunity to continue the motivation of the student for his work and to provide a source of suggestion for the improvement of the problem.
- c. The field problem. The field problem is a training situation in which the activities of the student or student group take place over terrain or one site closely comparable to those under a real situation. Usually it is emphasized in tactical, logistical, and advanced technical training where teamwork among the individuals of a group is required. It may be used, however, for training individuals.

- (1) Preparation. As with most problem-solving situations, the field

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problem is built on preliminary instruction and serves as a culmination of that instruction. The problem must be constructed by the instructor, as previously described, around these points:

(a) Necessary preparation.

- (1a) Selecting the problem based on lesson objectives, previous instruction, and time available.
- (2a) Surveying the terrain and equipment available or required.
- (3a) Keeping all factors realistic.
- (4a) Determining the standards of student performances.

(b) Development of preliminary and periodic instructions for the problem.

- (1a) Setting the stage.
- (2a) Guiding the trainees.

(c) The technique of performance.

(d) Planning the critique.

- (2) Presentation. The emphasis in the field problem is on student performance. The instructor should keep in the background as much as possible. He should not stop a procedure or operation unless an error occurs that would cause the men to learn incorrect habits or procedures. If it is apparent that the operation is not going according to schedule, one of two possible errors occurred:

- (a) The preliminary instruction was inadequate.
- (b) The type of problem set was too advanced.

The instructor must provide opportunities within the problem for the students to use their imagination, ingenuity, and initiative in solving the problem. Vague, uncertain, or ambiguous situations must be avoided in such problems. The training given within the exercise should be specific, and any unusual conditions arising that require techniques beyond the skill of the trainees will destroy the value of the remainder of the problem.

- (3) Critique. The instructor conducting the field problem should be thoroughly familiar with the tactical or technical principles of the applicatory exercise as well as how to conduct a critique. A critique is a method of instruction. The instructor must plan his critique as carefully as his problem. It will be necessary,

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during the performance, for the instructor to watch for specific examples of good and poor performances, to make brief notes on the techniques and procedures used and how they could be improved to meet the standard he has established. The critique must be held as soon as possible following the completion of the problem and in the same location or on the same terrain over which the problem was conducted.

(4) Cautions in the use of field problems.

- (a) Use competition.
 - (1a) Desirable as a motivating factor.
 - (2a) Should not be allowed to develop ill feeling among the men.
- (b) Keep to objectives when setting up field problem.
- (c) Avoid problems requiring the application of too many newly presented principles and procedures.
- (d) Plan problem in terms of the entire training situation.
 - (1a) Condition of the men.
 - (2a) Their other assignments.
- (e) Plan for adequate amount of time.
 - (1a) Field problems consume more time than any other method of instruction.
 - (2a) Field problems should be scheduled at the place in the training program where it will be most effective.

Approved For Release 2001/11/01 : CIA-RDP78-03362A001800080001-1

PROBLEM EVALUATION AND CONSTRUCTION SHEET

Elements of Operational Situation	Importance Relative to Objective	Physical Capabilities	Capabilities of Students	What Can Be Done (Duplicate)

Approved For Release 2001/11/01 : CIA-RDP78-03362A001800080001-1

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7-20.10/54

CONSIDERATIONS REQUIRED IN
PREPARATION OF A PROBLEM

1. Establish Objectives

- a. Will the objectives provide the student an opportunity to use previously taught knowledge, skills and techniques in the pattern likely to be required by an operational situation?
- b. Are the objectives clearly defined so that the student realizes what is necessary for him to do or accomplish?
- c. Are the objectives such as to substantiate the use of the problem?

2. Plan the initial instructional situation and requirements

- a. Eliminate unimportant elements
- b. Determine status of trainee skills relative to accomplishing the elements and importance of each
- c. Duplicates real elements either actually or by simulation

3. Plan the conduct of the problem

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a. Control and check points

b. Testing content

c. Additional situations and requirements

d. Critique

5. Administrative details

a. Mechanical and physical aspects of the problem should be well prepared:

b. Terrain and area preparation

c. Rehearsal

PRELIMINARY KNOWLEDGE HELPFUL TO AN INSTRUCTOR
IN HIS PREPARATION OF
A PROBLEM

HOW WE THINK
(REASONING PROCESS)

1. FELT DIFFICULTY
2. DEFINE PROBLEM
3. POSE SOLUTION
4. EXAMINE SOLUTION
5. TAKE ACTION

HOW THE INSTRUCTOR
MAKES USE OF THE
REASONING PROCESS

