DOCUMENT RESUME

ED 071 349 EM 010 494

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TITLE	Introduction to Psychology and Leadership. An Analysis and Evaluation of Instructional Methodology for a Multimedia Course in Leadership, Psychology, and Management. Phase III, Evaluation Report.
INSTITUTION	Naval Academy, Annapolis, Md.; Westinghouse Learning Corp., Annapolis, Md.
SPONS AGENCY	National Center for Educational Research and Development (DHEW/OE), Washington, D.C.
REPORT NO	TR-6-15
BUREAU NO	BR-8-0448
PUB DATE	1 May 71
CONTRACT	N00600-68-C-1525
NOTE	69p.; See also EM 010 418 and EM 010 419
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	*Autoinstructional Aids; Communication (Thought Transfer); Curriculum Design; *Curriculum Development; *Evaluation; Individualized Curriculum; Individualized Instruction; Individual Psychology; Instructional Design; Leadership; *Leadership Training; Management Education; Military Training; Multimedia Instruction; Performance Criteria; Psychology; Social Psychology; Technical Reports

ABSTRACT

An assessment of the effectiveness of the second implementation of the United States Naval Academy multimedia course in leadership, psychology, and management is presented in this report. Descriptions of the course, the media and presentation forms used, and the procedures for course revision are provided. A brief description of the instructional research involved in the project is also given. EM 010 418 through EM 010 447 and EM 010 451 through EM 010 512 are related documents with the final report appearing under EM 010 418, EM 010 419, and EM 010 484. (Author/RH)

Westinghouse Learning Corporation

Contract No. N00600-68-C-1525

AN ANALYSIS AND EVALUATION OF INSTRUCTIONAL METHODOLOGY FOR A MULTIMEDIA COURSE IN LEADERSHIP, PSYCHOLOGY, AND MANAGEMENT PHASE III EVALUATION REPORT

TR 6.15

May 1, 1971

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I. INTRODUCTION

The first implementation of the Leadership, Management and Psychology course occurred in the spring of 1970 and was documented in An Analysis and Evaluation of Instructional Methodology For A Multimedia Course in Leadership, Psychology and Management, Phase II Evaluation Report (TR-6.11), and Report of Phase II Research Findings: The Design and Methodology for Research on the Interaction of Media, Conditions of Instruction, and Student Characteristics for a Multimedia Course in Leadership, Psychology and Management, Part I: Conditions of Instruction (TR-6.12a). During the summer of 1970 the materials were revised on the basis of empirical data and the course was validated for a second time in the fall of 1970. This report describes the fall of 1970 implementation, evaluates the effectiveness of the revised materials and discusses the procedures used in the final revision cycle which preceded the actual installation of the course in the spring of 1971.

During the second implementation, Westinghouse Learning Corporation continued its investigation into the relative effectiveness of various media and presentation forms employed in the course and their relationships to a variety of learner characteristics. These results will be presented in a Phase III Research Report.

II. DESCRIPTION OF THE COURSE

For the benefit of readers unfamiliar with the USNA multimedia Leadership, Psychology and Management course, this section offers a discussion of the developmental effort and rationale underlying the course, a description of the course as it was constituted in the second validation run, and a description of the system used in the fall of 1970 implementation.

A. Non-Research Aspects of the Course

Content Outline and Objectives. The content outline for the course was developed jointly by WLC and the USNA Naval Science Department. Sources for the content outline were WLC and USNA subject matter experts, texts on management and naval science, and excerpted materials used in the traditional USNA Leadership Management course. Reference sources were presented in bibliography form at the end of the content outline for each part of the course. Once the nature of the content was determined, rough drafts of behavioral objectives were developed.

In the process of developing objectives, the actual sequencing and outlining of total course content was completed. The sequencing of topics within each level of the course was generally determined by input from subject matter experts and precisely determined by behavioral analysis. See Sequencing Rationale. (TP-6.2)

Specific behavioral objectives were developed at two levels for each topic heading within a segment. Terminal objectives (high level problem solving objectives) were developed for each major heading. Enabling objectives (lower level objectives) were developed where necessary to ensure the learning of information essential to the attainment of terminal objectives.

Content Organization. The content is divided into twelve parts, each representing a major content area. Each part is divided into varying numbers of segments, ranging from as few as two in Part I to as many as ten segments in Part V. A segment is a collection of learning objectives closely related by content which can be studied in about an hour's time. The segment serves as the logistical unit in implementation for purposes of scheduling and assessment ofstudent progress through the course materials. Appendix A lists the titles of each of the parts and segments in the course.

Depending on its intended use, a segment is classified as core, depth core, or enrichment. The 59 core segments include all of the information requisite to the attainment of the behavioral objectives. The student is required to complete all the core segments in the order in which they are sequenced. Depth core segments are in-class group discussions which are structured to provide "in-depth" examination of various concepts learned in core segments. The selection of depth core segments is made by the instructor. In the second validation run, six depth core segments were scheduled

with required student attendance. Enrichment segments are related to but not essential to the mastery of terminal objectives. They are optional for students who desire more information than that presented in core segments.

An additional content unit, the module, was created to carry the research experiments which are explained in the following section of this report. A module is a vehicle employed for the development and presentation of materials in which research variables are manipulated. Several parallel modules were prepared in each segment utilized for research purposes, representing variations specified by the experimental designs. The different modules of a segment are distinguishable from one another by differences in presentation variables and/or media, although the content is the same.

B. Research Aspects of the Course.

Dimensions of Presentation. Concommitant with the identification and sequencing of course content and objectives, WLC developed a series of instructional research hypotheses which were tested in the first implementation and retested in the fall of 1970 run of the course. A detailed explanation of the instructional research design can be found in the Report of Phase II Research Findings, Part I: Conditions of Instruction (TR-6.12a) and in the forthcoming Phase III Research Report. In this report only the basic dimensions of the research are given.

Research hypotheses were based on concepts presented in A Behavioral Approach to Instructional Design and Media Selection, in which a distinction is made between the importance of media and presentation forms (Tosti and Ball, 1969). The distinction is that the medium is only the mode of transmission of information whereas the truly important characteristics of instruction are the forms of presentation of the information within the medium. Any medium can be described with respect to its characteristic presentation dimensions and with respect to its capability for varying the dimensions of presentation. The most basic dimensions of presentation which characterize a medium are the form and frequency of the stimulus, response, and management decisions. In matrix form these dimensions are:

	Form	Frequency
Stimulus	Stimulus representation	Duration
Response	Response demand form	Response demand frequency
Management	Management form	Management frequency

Stimulus representation is the form in which the stimulus is presented. It can be written, spoken, or pictorial. Stimulus duration is the temporal stability of the stimulus. Duration can be transient, such as movies and lectures, or persistent, such as textbooks or other printed matter.

Response demand form is the type of response the student is required to make. The form of the response demanded can be covert or various forms of overt responses. Response demand

frequency is the frequency with which the student is required to respond. The frequency with which questions are asked within an instructional sequence can be high, medium, or low.

Management form is the type of remediation the student is given. It can be multilevel - remediation by differing levels of response demand frequency within a single form; multiform - remediation by a different form of presentation; repetition - a simple repeat of the same presentation; or error diagnostic - remediation by branching according to specific incorrect responses. Management frequency is the frequency with which the presentation is repeated or changed according to the need for remediation. The frequency of management can be high, medium, or low depending on response demand frequency.

The Phase II Evaluation Report reviews the rationale underlying initial media selection and explains changes in the media employed in the second implementation as a result of the data from the first run.

Presentation Design. The media and presentation forms implemented in the fall of 1970 are shown schematically in the Presentation Design (Appendix B). The Presentation Design depicts the sequence of segments and the modules (media and presentation options) available in each segment. In following the Presentation Design, read from left to right first in the upper schema and then in the lower schema on each page. The student studied the segments in numerical order, seeing only one module in each segment. The first box in the upper left corner

of Appendix B is numbered 1.1, indicating that it is Part One, Segment One. The medium in which it is developed, Syndactic Text, is shown inside the box (the format of the Syndactic Text will be discussed later). Upon completing Segment 1.1, the student proceeds to Segment 1.2, which as is indicated in the next box is a discussion booklet. Segments 1.1 and 1.2 are the only segments available in only one media and presentation form. The third segment the student encounters is Segment 2.1 which is available in four different modules (vertically arrayed in four boxes). Above each box is a three digit number. The first digit indicates the part, the second digit the segment, and the third digit is the module identifier. The media and presentation differences between the modules are described by the notations inside the boxes. The last segment encountered is Segment 12.4.

Media and Presentation Variables. Media used in the fall of 1970 implementation were audiotape/panelbook (AT/PB), AT Script/PB, audiotape/intrinsically programed booklet (AT/IPB), AT Script/IPB, computer assisted instruction (CAI), CAI Script/IPB, linear text and syndactic text. A description of the media and each of the variations in presentation form (modules) within each medium is given in this section.

In the audiotape/panelbook (AT/PB) segments (2.2-2.5, 3.1-3.4, 5.7-5.10 and 7.1-7.4), instruction is delivered in lecture format by a commercial radio announcer reading from a prepared script. The audiotapes were developed in a commercial recording facility using standard recording tapes,

and were transferred to cassette cartridges for student use. All charts, photographs, and drawings accompanying the audiotape lecture are presented in a panelbook.

Variations in the modules reflect different combinations of three presentation conditions - response demand frequency, response demand form and presence or absence of confirmation. In addition to illustrations, the panelbook contains questions on the instructional material. The frequency with which a response is required is either high (about 20 questions/panelbook) or low (about 3 questions/panelbook). The form of the response the student makes to these questions is either covert (he thinks over his answer) or overt (he records his selection on an answer sheet). In some modules confirmation to the questions is provided while in others the student never receives the correct answer.

In some segments, (7.5, 9.1 and 9.2) an alternative to the audiotape/panelbook is the audiotape script/panelbook medium where the printed (as opposed to the audio) version of the script is used by the student in conjunction with a panelbook. In these segments only one presentation condition, presence or absence of content maps, is manipulated. The content map is a hierarchical structuring of the terminal and enabling objectives in the segment and is used as an advance organizer by the students.

Another variation in usage of a taped medium is the audiotape/intrinsically programed booklet (AT/IPB) combination. The instruction is delivered via the audiotape while questions

requiring an active response are posed in the intrinsically programed booklet. The presentation variables manipulated in these segments (4.4-4.7) are response demand frequency and management frequency within the IPB. In the modules characterized by high frequency of response (about 20 questions/IPB), the management frequency ranges from high (error diagnosis on every question) to medium (error diagnosis on every other question) to low (no error diagnosis). In the low response demand frequency condition (about three questions/IPB), management frequency is also low. The audiotape/IPB media combination is paralleled in each case by another media mix which is hardware-free: the audiotape script/intrinsically programed booklet combination. Only one IPB version, the high response demand frequency/high management frequency version, is used in conjunction with the script.

There are two segments (10.1 and 10.2) in which the intrinsically programed booklet is used either with an audiotape or a script and the only presentation dimension manipulated is the presence or absence of a content map.

A different medium, computer assisted instruction (CAI), is used in some segments (12.1 - 12.4) to carry presentation variables similar to these tested in the audiotape/IPB segments (4.4 - 4.7). The CAI material was developed for the 1500 Instructional System, utilizing the three components of the system - CRT display, audio, and image projector. The

informational frames are presented on the CRT screen and image projector. The questions, which are often situations in which the student has to choose the best course of action, are presented: 1) on the audio, where the situation is described; 2) on the image projector, where pictures of the situation are presented along with the audio; 3) on the CRT screen, where the student is asked to select an answer.

In each CAI segment there are four modules in which response demand frequency and management frequency are manipulated just as they were in Segments 4.4-4.7. In addition, WLC developed a fifth module, the CAI script/ intrinsically programed booklet for implementation in the fall of 1970 run. The intent of this module is to offer a hardware-free version of the CAI material. To more closely simulate actual operation of the CAI system, the paper version incorporates the script in the IPB (which is the high response demand frequency, high management frequency version).

Printed matter serves as the medium for several types of materials prepared by WLC. The linear texts (Segments 4.1-4.3, 5.1-5.6, 8.1-8.3) have been developed by the RULEG and EGRUL methods of programing (Rule-example; example-rule). These are essentially programing methods of presenting a rule (definition, principle) and having the student identify an example of the rule (from 2, 3, or 4 choices), or presenting an example and having the student identify the rule or principle which is depicted in the example.

Variations in the linear text modules are permutations of two presentation dimensions - response demand frequency and response demand form. In three modules the response demand frequency is high, with a question for each information frame. The only difference among these modules is in the three forms of response required of the student. In one form the student is requested to underline the key points in the correct response, in another form he records his selection (A, B, C or D) on an answer sheet and in the third form he responds covertly - that is, he merely reflects upon his answer. These three forms of response are repeated using linear text modules which are characterized by low response demand frequency. In these modules a question is asked about every tenth frame. The remaining frames which were question frames in the high response demand frequency module are restructured as information frames.

The syndactic text (Segments 2.6-2.8, 6.1-6.3, and 11.1-11.3) contains several summary statements each followed by a summary quiz of about five questions. The presentation dimensions which are varied among the three syndactic text modules are management frequency, management form and response demand frequency. In two modules there is medium management frequency, that is, the student is sent to the next summary statement if he correctly answers all questions on the summary quiz or he is required to study other material if he incorrectly answers any questions on the summary quiz.

In the two modules with medium management frequency there are two types of management forms: (1) the programed sequence, a sequence of linear frames characterized by high response demand frequency and (2) the detailed summary, a prose version of the content of the programed sequence, with no response demand required. To provide data for materials revision, a scrambled version of the identical summary quiz is readministered after the student completes the programed sequence or detailed summary. The third module developed for syndactic text has no management condition. In this module the student simply reads the summary statement and takes and scores the summary quiz. Regardless of his performance on the summary quiz, he continues to the next summary statement.

In some segments employing syndactic text (2.1, 2.9, 3.5, 6.4) only the module with the linear frames is used and the variables manipulated are the presence or absence of a special answer form and content maps.

Finally in some segments of syndactic text (5.1-5.3, and 8.4-8.6) only the presence or absence of content maps is manipulated.

C: Implementation

The second implementation of the course in which forty-four USNA midshipmen participated was conducted in the fall of 1970. The course was administered by a full-time staff consisting of an on-site WLC instructor and two data clerks. The instructor was responsible for tutoring students,

selecting and guiding group discussions (depth core), scheduling and administering USNA examinations and determining grades. The data clerks controlled materials distribution, administration of cumulative posttests, scoring of progress checks and collection of frame response forms and questionnaires.

Students were routed through the course according to procedures outlined in the Student Guide. Each student had been preassigned randomly to a particular module in a segment and was required to follow exactly his unique track through the course materials. The students were allowed to work through the materials at their own speed as long as they maintained a minimum pace which ensured proper preparation for depth core meetings and USNA exams. After studying a segment the student took a progress check which was handed out with the instructional materials. (The progress check is discussed in detail in a later section of this paper.) The progress check was scored by the WLC staff. If the student did not attain a score of 80% or better on the progress check, he was required to go through a remediation cycle. In remediating, a student reviewed instructional materials pertinent to the content missed on the test items and then retook the progress check. If he failed to achieve 80% correct on the second trial of the progress check, the student was tutored by the instructor.

Of the 59 segments in the course, 48 were included in groups of 3 or 4 in research units. Upon completing each

research unit the student was required to take a research test, the cumulative posttest (CPT), which is used to measure the effects of different presentation and media conditions on student performance. When the student studied a segment in a research unit, he took the progress check and went on to the next segment. After all the segments in the research unit were completed, the student turned in the progress checks for those segments, and took the CPT. The progress checks were graded and shown to the student if he scored 80% or better. If he failed to achieve the 80% criterion, he had to remediate. Thus, remediation on research segments was postponed until after the CPT was taken. In the eleven non-research segments, the student's progress check was graded and any remediation necessary took place before the student began the next segment.

III. DESCRIPTION OF EFFECTIVENESS MEASURES

A. Test Item Pool

WLC developed a pool of criterion referenced test items to provide the capability of assessing the effectiveness of the course. The specification for developing test items was that two test items be developed for each of 12 objectives in a segment; there are thus approximately 1400 items in the pool (24 x 59 = 1416). The selection of objectives to be included was based primarily on the need for representative coverage of terminal objectives, and secondarily on representative coverage of enabling objectives. All test items in the pool bear a one-to-one relationship to behavioral objectives. Since both WLC and USNA subject matter experts assisted in the development and review of the test items, content validity for all items can be assumed. Enabling objectives not covered by test items in the test item pool are measured within the course materials by criterion frames.

B. Administrative Pre and Posttest

Administrative tests were developed to provide an instrument for evaluating total course achievement. The administrative pre and posttest was actually one 80-item test which was administered once at the beginning and once at the end of the course. (The administrative pre and posttest is distinct from USNA examinations which were

administered throughout the course by the USNA instructor for purposes of assigning eight-week and final course grades.)

The administrative pre and posttest was developed by representatively selecting test items from the test item pool. In this way, there was at least one test item selected from each segment of the course, plus an additional test item from each of 21 segments.

It was necessary to delete 5 test items from the analysis of the administrative data because the content for these items was revised substantially between the administration of the pre and posttests. In addition the pre/posttest data for one student was incomplete. The pre and posttest analyses therefore are based on 75 test items and 43 students.

C. Progress Checks

Progress checks were developed to measure student achievement on each of the core segments. They were tests made up of a minimum of 10 criterion referenced items drawn from the test item pool. On 7 of the 59 segments there were more than 10 test items because these segments contained an unusually high number of behavioral objectives.

As mentioned in the discussion on course implementation, the progress checks were handed out with the materials. Students were instructed to study the material and then take the progress check. The progress checks were corrected by the WLC administrative staff and if the student did not score

80% or better, he was required to restudy material pertinent to the test items missed and to retake the progress check. If after the second trial the student still did not attain 80% on the progress check, he was tutored on the questions he missed. Thus the instructional system ensured that the student would learn the minimum criterion of 80% of all progress checks test items. Since there is a one-to-one correspondence between the behavioral objectives and the criterion referenced test items, it can be said that all students learned 80% of the measured course objectives.

IV. EVALUATION OF COURSE EFFECTIVENESS

Since the Leadership, Management and Psychology course is based on a behavioral approach to instruction, the measurement of total course effectiveness is based primarily on student test performance over a series of behavioral objectives. The premise for this form of evaluation is that once behavioral objectives are developed for a course and everyone agrees that they are necessary and worthwhile objectives, then the test of the effectiveness of the system is simply whether students attain the objectives.

The measurement of student performance on stated behavioral objectives is a technique for assessing the absolute effectiveness of a system. Relative effectiveness could be assessed by comparing the effectiveness of one system or portions of the system to other systems. The relative effectiveness of the WLC multi-media system vis à vis the effectiveness of the existing USNA Leadership courses has not been assessed for the following reasons:

1. The evaluation of the multi-media course is based on student performance on test items covering over 600 of the approximately 1500 behavioral objectives. A comparison of the effectiveness of the multi-media course to other courses would therefore necessitate the inclusion of over 600 measured objectives in the other courses. To compare effectiveness based on final examinations alone would mean comparing effectiveness on only a small sample of objectives rather

than on the wider and more reliable sample offered by the progress check tests.

2. A second consideration in multi-media vs. existing leadership course comparisons is the possible Hawthorne and Rosenthal effects which may bias results. These two effects are respectively the tendencies 1) for students to realize they are in an experiment and to perform beyond typical expectations (Schramm, 1964) and 2) for teachers to realize they are being compared and thus alter their typical patterns of instruction (Rosenthal, 1966).

3. If the effectiveness data for the multimedia course and the existing leadership course were not identical, there would be no way of accounting for the differences. Since several different media and forms of presentation are being used in the WLC course, and since teaching methods and materials vary from one USNA instructor to another, there would be no clear cut indication of the conditions of instruction which account for total differences.

4. Within the multi-media course, the effort is made to compare the relative effectiveness of one mode of presentation to another. In making these comparisons, all variables except specially selected presentation or media variables are held constant, that is, students are given the same content, objectives and test items. Only under these circumstances is it possible to state that one form of presentation or media is relatively more effective than another.

5. The multimedia course is not intended to supplant the instructor in other courses. Its intent, rather, is to teach effectively the core content requisite to the understanding of Naval leadership, thereby reducing the need for the instructor's role as strictly a disseminator of information. An instructor using multimedia materials need only augment prepared materials with personal guidance of students. That is, he is able to select points he would like to highlight, lead group discussions, tutor and counsel students, and in general use his time as a professional to invent new and creative ways of simulating leadership experiences. With these considerations in mind, studies of the effectiveness of systems which essentially compare one role of the instructor to another role are too global to be of value.

A. Evaluation Based on Administrative Pre/Posttest

The most direct although somewhat simplistic estimate of total course effectiveness is obtained by comparing student performance at the beginning and at the end of the course. For this purpose WLC developed a 75-item administrative pre/posttest which measures performance on a representative sample of the approximately 1500 behavioral objectives in the course. This test was given to the students before they began the course and again when they completed it, so that a gain from pre to posttest could be computed. However the actual gain from pre to posttest is a relatively

incomplete effectiveness index because it does not take into account the amount of total gain that was possible.

An index which does represent how much students learn with respect to how much they could have learned is the gain score ratio. This is the ratio of actual gain to maximum possible gain. The formula for the gain score ratio is:

$$\frac{\text{(Posttest Score)} - \text{(Pretest Score)}}{\text{(\# Items on Test)} - \text{(Pretest Score)}}$$

The gain score ratio has been calculated for each student and as can be seen in Table 1, there is a wide range in the ratios with a clustering of scores in the .40 to .60 intervals.

TABLE 1

Frequency Distribution of Individual Gain Score Ratios (N=43) Administrative Tests,

Gain Score Ratio	Number of Students
.900 to .999	0
.800 to .899	0
.700 to .799	2
.600 to .699	7
.500 to .599	12
.400 to .499	10
.300 to .399	9
.200 to .299	2
.100 to .199	1
.000 to .099	0

Table 2 gives the means of the individual scores used in determining the mean gain score ratio of .495 for the course.

TABLE 2

Administrative Tests,
Mean Gain Score Ratio
(# of Test Items=75, # of Students=43)

Posttest Mean Score	Pretest Mean Score	Mean Gain	Maximum Possible Gain	Mean Gain Score Ratio
53.4	32.2	21.2	42.8	.495

An evaluation of the course based solely on pre/posttest performance, therefore, reveals that the students learned 49.5% of what they could have learned. It should be noted that in order to have a mean gain score of 100%, all of the students would have to miss all of the questions on the pretest and answer them all correctly on the posttest.

One problem associated with the use of gain score ratios in general is that there is no established standard by which to gauge them. To indicate that a system is 49.5% effective may seem to indicate that the system is not operating at an acceptable level of effectiveness. However, when the gain score ratio is interpreted in conjunction with the posttest average, it becomes more meaningful. In this

light, although the students gained only 49.5% of what they could have gained, their final scores were fairly high, averaging 71.2% (53.4/75 x 100).

To interpret further the gain score ratio it is necessary to consider each item of the pre/posttest from which the data are derived. Table 3 provides information on the percentage of students correctly answering each item on the two tests.

TABLE 3

Administrative Tests,
Items Correctly Answered by Percentage of Students

Percentage of Students	Number of Items Correctly Answered			
	Pretest	(Cum)	Posttest	(Cum)
91.0 to100.0%	0	0	18	18
81.0 to 90.9	3	3	14	32
71.0 to 80.9	7	10	8	40
61.0 to 70.9	10	20	14	54
51.0 to 60.9	9	29	7	61
41.0 to 50.9	10	39	7	68
31.0 to 40.9	13	52	2	70
21.0 to 30.9	9	61	4	74
11.0 to 20.9	7	68	0	74
1.0 to 10.9	7	75	1	75

By combining the last five intervals in Table 3, it can be seen that there are 14 items on the posttest which were answered correctly by fewer than half of the students. In large part these 14 items account for the low gain score ratio.

It was possible that these items performed poorly because they tested material taught at an early point in the course and the students had simply failed to remember the material. To investigate this possibility, the 14 test items were grouped into 4 quartiles such that quartile 1 represented test items on material in the first 15 segments (1.1-3.4), quartile 2 the next 15 segments (3.5-5.7), quartile 3 the next 15 segments (5.8-8.3) and quartile 4 the last 14 segments (8.4-12.4). The distribution of the 14 test items is:

Quartile	(Segments)	Number of Test Items
1	(1.1-3.4)	2
2	(3.5-5.7)	5
3	(5.8-8.3)	4
4	(8.4-12.4)	3

It would appear, therefore, that the different time spans between learning the material and answering questions on it was not a factor in the poor performance on these items.

To investigate further the impact which retention may have had on overall performance on the posttest, the percentages of correct responses on each posttest item were grouped into quartiles according to the segment which the test item represented and a mean percent correct was obtained for each quartile.

TABLE 4

Posttest Performance by Quartile (by Segment)

Quartile	(Segments)	Number of Test Items	Mean Percent Correct
1	(1.1-3.4)	22	69.9
2	(3.5-5.7)	18	72.0
3	(5.8-8.3)	21	68.9
4	(8.4-12.4)	14	75.4

Looking at the data in Tables 3 and 4, one may conclude that retention did not influence performance on the posttest in general or on the 14 specific items which performed poorly. Since retention has been eliminated as a possible explanation of low scores on some of the posttest items, the poor performance probably indicates either that the test item itself is faulty or that the material from which it is derived needs to be re-examined with respect to the adequacy with which it is taught.

B. Evaluation Based on Progress Checks.

An evaluation of course effectiveness, which is more comprehensive than that based on the administrative pre/posttest data, is achieved by analyzing progress check data which measure performance representatively across each of the 59 segments in the course. Bearing in mind that there is

considerable variation among segments, the "average" segment contains 8 terminal objectives and twice as many enabling objectives. A progress check test is taken at the end of each segment. The progress checks have a minimum of 10 items (7 progress checks have more than 10, ranging up to a maximum of 15 items). There is a test item in each progress check for each of the terminal objectives; the remaining items are based on enabling objectives. The enabling objectives which are not tested on the progress checks are covered by criterion frames within the materials. In aggregate the progress checks measure performance on 606 of the approximately 1500 behavioral objectives in the course. Since there is a one-to-one correspondence between test items and the objectives they measure, performance on progress checks is presumed to be a reliable index of performance in the course itself.

As described in Section III C, the student who fails to answer correctly at least 80% of the progress check test items is required to restudy material tested by the incorrectly answered items, then retake the progress check. If he still does not obtain a score of 80% or better on the second iteration, the student is tutored by the on-site instructor. Thus, the system ensures that the student master at least 80% of the measured objectives in the course.

Table 5 is a frequency distribution of the 606 progress check items tabulated by the percentage of students answering correctly on the first iteration.

TABLE 5

Objectives Measured by Progress Checks,
Frequency Distribution of Objectives
by Percentage of Students
Attaining Them - First Iteration

(# Objectives = 606, # Students = 44)

% Students Attaining Objectives	Objectives Attained on Progress Checks		
	Number	Cumulative #	Cumulative %
100%	115	115	19.0%
90 - 99	234	349	57.6
80 - 89	113	462	76.2
70 - 79	55	517	85.3
60 - 69	39	556	91.8
50 - 59	23	579	95.5
40 - 49	14	593	97.9
30 - 39	6	599	98.8
20 - 29	5	604	99.7
10 - 19	1	605	99.8
0 - 9	1	606	100.0

Table 5 reveals that at least 80% of the students correctly answered 76.2% of all of the progress check test items on the first iteration. This indicates that the materials in general are effective instructional tools. By combining the last 6 intervals in Table 5, it is seen that there are 50 (606-556) test items which were correctly answered by fewer than 60% of the students on the first iteration. Poor performance on these items can be attributed to a faulty test item, inadequate teaching of the objective, or high difficulty level of the objective itself. During the revision cycle following the fall of 1970, these test items/objectives were

examined and many were altered. Improved performance on these items can be expected during the next implementation of the course.

The progress check data have been analyzed by segment as well as by individual objective to identify those segments which were performing below criterion level. Table 6 is a frequency distribution of the segments by the percentage of students who correctly answered 80% or more of the progress check test items. The segments are tabulated by performance both before and after remediation.

TABLE 6

Frequency Distribution of Segments
by Percentage of Students
Attaining At Least 80% of Objectives
Before and After Remediation

(# Segments = 59, # Students = 44)

Percent Students Attaining 80% or Better	Segments			
	Before Remediation		After Remediation	
	No.	Cum No.	No.	Cum No.
100%	3	3	35	35
90-99	23	26	22	57
80-89	13	39	1	58
70-79	8	47	0	58
60-69	6	53	1	59
50-59	1	54		
40-49	4	58		
30-39	1	59		
20-29				
10-19				
0- 9				

In judging adequacy of performance, WLC maintains a criterion level of 80-80, that is, 80% of the students must achieve 80% of the objectives, if not on the first iteration, then on the second iteration (after remediation) or in individual tutoring sessions. The "After Remediation" figures in Table 6 indicate that only one segment failed to meet the criterion level of performance. However, in Table 6 "Before Remediation" data show that 20 segments did not attain the 80-80 criterion if segment performance is judged against the more stringent standard of first iteration performance alone. These 20 segments (and their progress checks) were scrutinized and revised prior to production of the final course materials.

It is of interest to note that of the 50 test items cited in Table 5 as poor performers, 31 are found in those segments which failed to achieve the 80-80 criterion on the first iteration. Apparently, these individual test items which had low scores contributed to lowering the performance of the entire segment.

Tabulation of mean scores on progress checks yields a different analysis of progress check data which is more flexible for purposes of comparison than the classification of segments according to the percentage of students who meet the 80% performance criterion.

TABLE 7

Progress Check Mean Percentage Correct (Before Remediation), Mean Time, Student Rating (High/Low) Of Interest Level Of Materials

Segment Number	Mean Percentage Correct	Mean Time (Number Minutes)	Percentage of Students Rating Interest Level of Materials as: High	Low
1.1	87%	90	82.5	2.5
1.2	84	48	39.4	18.2
2.1	88	51	65.9	2.3
2.2	86	48	46.3	9.8
2.3	70	76	18.7	23.3
2.4	78	49	35.7	11.9
2.5	90	58	36.6	12.2
2.6	82	68	53.9	12.9
2.7	72	60	48.7	0.0
2.8	86	60	55.5	2.8
2.9	90	52	71.1	2.6
3.1	73	50	13.5	16.2
3.2	80	43	30.0	10.0
3.3	70	48	26.3	15.8
3.4	87	50	13.8	24.3
3.5	93	47	61.5	5.1
4.1	92	61	41.0	23.1
4.2	95	52	35.9	20.5
4.3	84	52	38.4	12.8
4.4	95	67	32.5	17.5
4.5	95	59	33.3	15.1
4.6	90	50	35.9	15.4
4.7	90	48	40.5	10.8
5.1	89	55	25.7	12.9
5.2	76	57	22.5	10.0
5.3	92	41	24.4	9.8
5.4	84	56	25.0	22.5
5.5	82	46	19.5	19.5
5.6	82	40	28.2	15.4
5.7	83	29	22.5	20.0
5.8	90	39	13.5	8.1
5.9	79	54	10.3	10.3
5.10	90	34	15.4	10.3

TABLE 7 continued

Segment Number	Mean Percentage Correct	Mean Time (Number Minutes)	Percentage of Students Rating Interest Level of Materials as: High	Low
6.1	90	67	17.1	12.2
6.2	85	63	24.4	14.6
6.3	88	60	15.4	12.8
6.4	87	44	32.4	5.4
7.1	81	41	18.0	12.9
7.2	87	46	10.3	7.7
7.3	80	38	15.4	12.9
7.4	78	4[illegible]	13.1	15.8
7.5	83	3[illegible]	37.5	2.5
8.1	87	64	29.3	21.9
8.2	91	66	35.0	17.5
8.3	92	57	29.3	12.0
8.4	94	44	47.5	2.5
8.5	87	50	33.3	5.1
8.6	87	50	43.6	7.7
9.1	91	42	22.5	10.0
9.2	91	42	22.5	15.0
10.1	95	61	17.0	29.5
10.2	91	50	33.3	5.1
11.1	82	42	19.5	9.8
11.2	93	26	24.4	9.8
11.3	90	46	38.5	5.1
12.1	93	53	72.1	0.0
12.2	82	61	50.0	2.3
12.3	93	36	58.5	4.9
12.4	83	42	43.6	12.8
MEAN	86	51	34%	12%

Table 7 reports by segment the average percentage of progress check test items answered correctly before remediation, as well as the average time students spent on the instructional material in each segment and the interest they indicated in the materials. Student time

and attitude are discussed in detail in the following Section, IV. C. The remainder of this section is a discussion of mean progress check performance.

Certain restrictions are inherent in interpreting the differences in progress check performance among the segments which are shown in Table 7. The interpretation difficulties spring from the fact that the segments cover different content, are taught by different media and forms of presentation and are tested by different progress check items. Despite these reservations it can be seen from Table 8 (derived from Table 7) that, for whatever reasons, performance is considerably better on some segments than on others.

TABLE 8

Frequency Distribution of Segments by Mean Performance Before Remediation

Mean Performance, Progress Checks, Before Remediation	Number Of Segments	Cumulative Number
95-99%	4	4
90-94	20	24
85-89	13	37
80-84	14	51
75-79	4	55
70-74	4	59

Table 8 reveals that even before remediation most of the segments are performing at a level equal to or higher

than the criterion level of 80%. There are 8 segments in this table, however, which have average scores of less than 80%, indicating that they require revision. These segments have already been identified as needing revision on the basis of the 80-80 criterion.

At first blush these figures may appear to contradict the data in Table 6 which identify 20 segments as needing revision because they do not meet the 80-80 criterion. This occurs because Table 6 records the percentage of students achieving 80% or better on a progress check, and does not reflect the distribution of scores above 80% correct. To illustrate: in a class of 5 students there are 4 students who score 100% and 1 student who scores 70%. Table 6 would report this data as 80% of the students (4 out of 5) attaining 80% or better; Table 8 would report the same data as having a mean performance of 94%. Thus, although Table 6 shows that before remediation there are 20 segments no achieving the 80-80 criterion. Table 8 identifies only 8 segments which do not have an average score of 80% or better before remediation. By averaging the performance data for all segments in Table 7, it is seen that the average percentage correct before remediation is 86%.

Table 9 offers insight into the general improvement in the course effected by the revision cycle between the first (Spring 1970) and second (Fall 1970) implementations.

TABLE 9

Progress Checks - First and Second Implementations - Mean Percentage Correct, Before Remediation

Segment Number	First Run	Second Run	Segment Number	First Run	Second Run
1.1	82	87	6.1	80	90
1.2	67	84	6.2	82	85
2.1	78	88	6.3	91	88
2.2	68	86	6.4	87	87
2.3	65	70	7.1	69	81
2.4	71	78	7.2	83	87
2.5	65	90	7.3	77	80
2.6	71	82	7.4	78	78
2.7	63	72	7.5	74	83
2.8	89	86	8.1	82	87
2.9	65	90	8.2	81	91
3.1	66	73	8.3	92	92
3.2	66	80	8.4	76	94
3.3	75	70	8.5	77	87
3.4	79	87	8.6	77	87
3.5	84	93	9.1	80	91
4.1	83	92	9.2	88	91
4.2	85	95	10.1	93	95
4.3	87	84	10.2	89	91
4.4	92	95	11.1	80	82
4.5	82	95	11.2	91	93
4.6	73	90	11.3	83	90
4.7	77	90	12.1	87	93
5.1	78	89	12.2	85	82
5.2	70	76	12.3	94	93
5.3	74	92	12.4	85	83
5.4	69	84			
5.5	59	82			
5.6	70	82			
5.7	80	83			
5.8	90	90	MEAN - ALL SEGMENTS	78	86
5.9	78	79			
5.10	66	90			

Following revision, performance decreased on 5 segments, remained unchanged on 3 segments, and improved on the remaining 51 segments. The average percentage of progress check scores across all segments increased by 8% from 78% in the first run to 86% in the second,

C. Evaluation Based on Student Attitude.

Student attitudinal data were collected on a Module Questionnaire (Appendix C) which the students were asked to complete at the end of each segment. It was felt that the questionnaire would be filled out with greater candor if the students felt sheltered by anonymity so no attempt was made to link student names with completed questionnaires. Most of the 44 student complied with WLC's request that the questionnaires be completed and the number of students responding to the questions is at least 40 for each segment.

Some of the items on the questionnaire were useful primarily in revising the course materials; these items pertained to the difficulty of the material, the quantity of military examples used in the materials, the student's approval of the way the material was presented (media and presentation variables), and an open-ended question soliciting student opinions. The questionnaire data tabulated in this report as evaluative measures come from two items - the time the students spent studying instructional materials and their rating on a 5 - point scale of the interest level of the materials (both content and mode of presentation). These data are recorded

in Table 7 (page 30) of this report.

Although the actual time reported for a segment varies considerably among students, the average time/segment as reported in Table 7 is the most useful measure of segment duration. There is a wide spread in mean times for the segments, ranging from an average of 29 minutes for Segment 5.7 to an average of 90 minutes for Segment 1.1. The average time across all segments, however, is 51 minutes which is very close to WLC's general guideline of developing segments which would require 50 to 60 minutes of study time. Using the Module Questionnaire time data, it can be estimated that total instructional time for the course is 3000 minutes (51 min. x 59 segments) or about 50 hours. This figure is too low to reflect the actual time the students invested in the course because it does not include time spent taking the 59 progress checks (59 x 15 minutes = 15 hours), taking the 14 cumulative posttests (14 x 40 minutes = over 9 hours), taking the 4 USNA tests (4 x 50 minutes = over 3 hours) and attending the 6 depth core meetings (6 x 50 minutes = 5 hours). When these time figures are added to the 50 hours of instructional time, the total time becomes 82 hours. In addition to these 82 hours, all students spent some time being processed as they handed in materials, had their progress checks graded and received the next set of materials. Furthermore, those students who did not score the minimum of 80% correct on the first taking of the progress check were required to take the time to restudy pertinent material and

retake the progress check. When the 82-hour figure is inflated to incorporate these activities, it approximates 100 hours. Excluding holidays, a semester at the USNA lasts about 14 1/2 weeks; when the 100 hours are distributed over 14 1/2 weeks, the average amount of time the students spent per week is 7 hours (100 ÷ 14.5). Seven hours is definitely in line with the average number of hours a student is expected to spend on a conventional 3-credit course in which he attends 3 hours of lecture and is assigned 3-6 hours of homework each week.

The foregoing discussion of time data has been included in the section on student attitude because it is sometimes the case that if students feel a course is too time-consuming relative to their other courses, they tend to view it with a jaundiced eye. The time data reported by the students reveal, however, that this should not be a problem with the WLC course.

In the next implementation of the course the number of hours the student spends will decrease considerably because the cumulative posttests (9 hours) will not be administered, the materials will be distributed in larger blocks thereby facilitating processing, and the segments which did not meet the 80-80 criterion will be improved so the incidences of remediation and tutoring will decline. For the next implementation the time the student must invest in the course will likely not exceed 6 hours per week.

The second type of student attitudinal data, reported as an effectiveness measure because it impacts student acceptance of the course, is the students' rating of their interest in the materials. In response to question number 2 on the Module Questionnaire, "Was the material interesting?," the students circledthe description they felt most appropriate. Summary data on the responses to this question are reported in Table 7, page 30, with the Questionnaire ratings of "high" and "above average" collapsed into a single category representing "high" interest and the ratings of "below average" and "low" similarly collapsed into a single "low" category. These data in Table 7 are reported as the percentages of students who express high or low interest in the materials. Not reported are the percentages of students who rate the materials "average" - this can be calculated by subtracting from 100% the summed percentages of students in the high and low categories. In five segments employing audiotapes the percentage of students selecting the low category exceeds the percentage of students in the high category. In two other segments the high and low percentages are equal. In the remaining 51 segments more students found the material to be of high rather than low interest. The averages for all segments are: 34% of the students found the materials to be of high interest; 12% of low interest; and the remaining 52% thought them to be of average interest.

V. SEGMENTS-WITHIN-MEDIA EFFECTIVENESS

As previously discussed, differences in segment performance can be attributed to a multitude of factors such as differences in content, test items, media and presentation forms and the staff who developed the materials. Thus when differences in segment performance arise, the difficulty lies in determining the causative factors. The one factor which may most easily be isolated is that of the medium employed. To obtain some estimate of the influence the medium itself has on segment performance, one may average the results for material developed in each medium and contrast the averages. This has been done in Table 10.

One important qualification must be made in interpreting the results in Table 10. Although the materials have been grouped on the basis of media, the results should not be construed as evidence of the superiority or inferiority of one medium vis a vis another. These results do not reflect inherent qualities of the media as such, but are rather indications of the effectiveness of the materials which were developed for and presented in each medium. The reason for grouping and reporting results by media is to localize the variations in effectiveness of materials which may be attributable to teaching via different media. The results do not indicate comparisons of media made over identical content with identical test items, developed by the same writer and employing identical presentation variables.

In compiling the data for Table 10 it was often necessary to use data reported by module rather than by segment because the segment contained modules developed in more than one medium. Progress check performance data in Table 10 are derived from the figures in Appendix D which present a breakdown of student performance on progress checks by module. (The research report will offer in-depth analyses of the presentation and media variables manipulated within these modules.) The time and interest data in Table 10 are similarly tabulated on a "by module" basis.

TABLE 10

Progress Check Mean Performance (Before Remediation), Mean Student Time, Percentage of Students Rating Materials as Having High/Low Interest, Averaged Across All Modules Developed in Each Medium

Media	Progress Check Performance	Time	% Students Rating Interest Level	
		No. Mins.	High	Low
Audiotape/IPB	93	57	36	10
Audiotape Script/IPB	93	54	44	7
Audiotape Script/ Panelbook	89	41	24	11
CAI	88	48	68	6
Linear Text	88	55	31	18
CAI Script/IPB	87	47	61	4
Syndactic Text	87	52	38	8
Audiotape/Panelbook	82	41	23	14

In Table 10 the media are ranked, high to low, according to their progress check performance. To assess the relationship between performance and the other three items Spearman rank order correlations between performance and time, performance and high interest, andperformance and low interest have been computed. The correlational values yielded are:

.595	(performance-time)
.150	(performance-high interest)
-.020	(performance-low interest)

Although the correlation between performance and time is relatively high, with an n of 8 (8 media) the correlation is not significantly different from zero. Similarly, the other two correlational values are not statistically significant.

VI. REVISION PROCEDURES FOR COURSE IMPROVEMENT

In Section IV reference is made to the revision of course materials based on empirical data from the second implementation. The materials had already undergone one revision cycle before they were tested out in the second implementation. During the first revision cycle the extant materials were improved considerably (as shown in Table 9, page 34, average performance increased from 78% to 86%), two media were dropped and two new ones added.

As explicated in the Phase I Evaluation Report, the decision was made to omit two media - videotape/panelbooks and learning activity summaries - and to replace them by audiotape panelbooks and syndactic texts, respectively. The media which had performed best during the first implementation were computer assisted instruction (CAI) and audiotape/intrinsically programed booklet (AT/IPB). To ascertain if the segments developed in these media performed well primarily because of the hardware they employed, it was decided to prepare parallel paper versions of these segments and to offer them as media options to the hardware-concentrated modules. Thus was born module 5 in Segments 4.4 - 4.7 (AT script/IPB) and in 12.1 - 12.4 (CAI script/IPB). Referring to Appendix D, the reader will see that average performance on module 5 did not vary much from average performance on the modules using audiotapes or CAI.

The first revision cycle therefore entailed revision of most segments and the development of some segments in new media presentations, either as substitutes for media which were deleted or as additions to the current media selection.

The secondrevision cycle (which followed the second implementation of the course) was somewhat different from the first in that: (1) revision to materials was oriented toward improving those specific segments and test items which showed low performance rather than the more global upgrading of all the course materials which took place during the first revision; (2) a new element was added, namely revision of the content outline; and (3) the step toward developing a hardware-free version of all core content was completed by developing a syndactic text option for all audiotape/panelbook segments. These three aspects of the second revision cycle are discussed in this section under two headings which separate them into revision activities based either on hard data or on subjective professional judgement.

A. Use of Effectiveness Data

Of the 59 core segments, 20 were identified (see Table 6, page 28) as needing improvement on the basis that they failed to meet the most stringent criterion level of performance whereby 80% of the students would correctly answer 80% of the progress check test items on the first try. These segments were examined by WLC writers and subject matter experts who revised material with which the students had experienced difficulty. Examples used as concrete illustrations of

principles were sharpened, and the progress check items were modified by altering the stem to remove any ambiguities and/or altering the responses so that the correct response more closely corresponded to what was taught in the materials. Likewise, the distractors which had drawn many responses were examined and modified.

In addition to using their professional expertise to hone the quality of the instructional materials, the WLC personnel used computer printouts of progress check test item analyses to guide them in the revision process. The printouts listed the number and percentage of students who had selected each response to each item on the progress checks both before and after remediation. This data provided a clear picture of which objectives were misunderstood on the first attempt but were grasped after remediation (indicating that perhaps the test item or a particular aspect of teaching the objective needed revision), and which objectives were not attained either before or after remediation by many students (revealing most likely that instruction on the entire objective should be clarified or amplified).

Furthermore, data from the test item analyses were used as a basis for revising all test items which were not correctly answered by 80% of the students on the first try whether or not the progress check belonged to the 20 segments which were revised because of failure to meet the 80-80 criterion.

Table 5 (page 27) shows that 76.2% of the test items were correctly answered on the first iteration of the progress checks. The remaining 24.8% were modified in light of the data on the test item analyses. Thus the entire revision process relied heavily on the empirical data from the second implementation of the course in preparing the materials and progress checks in their final form.

Mention should be made here that the administrative pre/posttest was not modified before being given to the students involved in the third implementation.

In order to revise the administrative test, in depth analysis comparing pre and posttest performance from the fall of 1970 run was required to identify any inadequate test items. The course was run for the third time during the second semester (Spring) of 1971 and the time interval of one week between the administration of the posttest to the fall of 1970 students and the administration of the pretest to the spring of 1971 students did not permit the requisite analysis. After the pretest had been administered to the third group of students, analysis of the data from the second group revealed a number of test items, (see Table 3, page 23) on which performance was poor. Before administering the posttest to the third group of students, the above-mentioned items will be analyzed to determine whether they should be excluded from the posttest.

The empirical results of the second implementation also served as the foundation for what was ultimately a subjective decision on the media selections to be incorporated in the final production of course materials. Data from the first implementation had revealed that segments developed in videotape/panelbook and learning activity summary modes had low overall performance; these media were dropped from the course since efforts to revise them did not seem warranted. In a similar fashion, the media employed in the second implementation were evaluated by assessing the effectiveness of the segments developed within them. Table 10, page 40, lists the average effectiveness of segments developed in each of the media - the lowest average performance occurs in the audiotape/panelbook segments where the mean performance before remediation is 82% which, although it is the lowest score, still exceeds the 80% which WLC set as the minimum level of acceptable performance.

The 20 segments which did not meet the 80%-80% criterion on the first iteration (Table 6, page 28) are grouped by media in Table 11 to yield a clearer picture of possible media influence on poor performance on some segments.

Table 11

Identification by Media of the 20 Segments Not Meeting the 80%/80% Criterion, First Iteration (Reference Table 6, page 28)

Audiotape/ Panelbook Segments		Linear Text Segments	Syndactic Text Segments	CAI Segments
2.3	5.9	5.4	2.6	12.2
2.4	7.1	5.5	2.7	12.4
3.1	7.3	5.6	5.2	
3.2	7.4		8.6	
3.3	7.5		11.1	

Because half of the 20 segments which performed poorly were developed in the medium of audiotape/panelbook (AT/PB), the possibility of eliminating this medium altogether was considered. However, since overall performance on this medium was at an acceptable level (82%), the decision was made to retain it and to give attention to optimizing the effectiveness of the medium per se in all AT/PB segments as well as to subjecting the specific 10 segments to the standard revision process. Since instruction in the AT/PB medium is so heavily oriented toward aural delivery, attention was given to stylistic and delivery variables as well as to content itself. WLC recognized the basic differences between written and auditory presentations and took pains to revise the impact of the auditory style of instruction. This entailed rephrasing of the audiotape scripts and retaping each of the 19 AT/PB segments. The

panelbooks which were used as an adjunct to the taped lectures were left virtually unchanged.

B. Subjective Evaluation.

WLC concurred with the USNA's suggestion to render implementation of the course more flexible by delivering a paper version to parallel every core segment tied to hardware. The syndactic text mode of presentation was selected to carry the paper version of the AT/PB segments because syndactic text is essentially a linear programed text which incorporates an additional element of management in the guise of the summary and summary quiz. A major effort, therefore, in the second revision cycle was the generation of parallel syndactic texts for the 19 AT/PB segments.

In "syndacticizing" these segments, the writer divided an audiotape script into approximately three major content areas and wrote a summary for each area. A summary quiz was then developed to measure comprehension of the content presented in the summary. The next step was the generation of linear frames to be used as remediation by the student who did not correctly answer all questions on the summary quiz. The linear frames taught essentially the same content as the summary but provided instruction in smaller steps and frequently supplemented the instruction with examples. Portions of the panelbook, such as diagrams and charts, were included in the syndactic text where they were essential to

instruction. Many pictures and illustrations in the panelbook were eliminated from the syndactic text when their presence was not requisite to the learning of the material.

Subjective evaluation of content, with regard to appropriateness and level of specificity became a major area of concern during this final revision. It was the point of view of the contractor that the content outline had been developed along a spiral or helical structure. This pattern of organization suggests that complex notions are best taught in recurring cycles which allow the learner to look at many facets of the same concept. Specifically, instructional material dealing with communication should not be relegated to that section entitled Interpersonal Communications, but should be reintroduced as it relates to other areas of content such as Morale, or Senior Subordinate Relations. According to the logic of the spiral construct a chart or graph which serves a specific purpose in one chapter can be purposely introduced again in another section to focus on another aspect of the issue represented. It was unfortunate that this approach was deemed by the customer to cause redundancy. Indeed, the question of redundancy and necessary changes to the content outline was a clear conflict of views. The data compiled by the contractor indicated not only a high student interest level in the materials, but additionally, in response to question 7

on the Module Questionnaire asking, "Did you feel that there were any sections of the materials that were unduly repetitious?," a mean of 93.8% of all students answering this question replied in the negative. Therefore, it was with a great deal of reluctance that the contractor shared the efforts in deleting previously agreed upon materials from the content outline.

The scope of this effort entailed the re-examination of the skeletal framework of each segment, and the actual revision of 80% of the segments (32 segments were extensively revised and 14 had minor changes). These changes to the content outline necessitated corresponding alterations to materials and test items.

APPENDIX A

COURSE OUTLINE

PART ONE: Overview of Leadership

Segment I	Concepts of Leadership
Segment II	Standards of Leadership in the Naval Service

PART TWO: Individual Behavior

Segment I	Introduction to Psychology
Segment II	Behavior and Its Observation
Segment III	Learning
Segment IV	Factors Affecting Learning
Segment V	Attention and Perception
Segment VI	Motivation
Segment VII	Conflict
Segment VIII	Neurotic and Psychotic Reactions
Segment IX	Personality

PART THREE: Group Dynamics

Segment I	Characteristics of Groups
Segment II	The Relation of the Leader to the Group
Segment III	Group Interactions
Segment IV	Conformity as a Factor of Group Behavior
Segment V	Relation of the Individual to the Group

PART FOUR: Achieving Effective Communication

Segment I	Importance of Interpersonal Communication
Segment II	Types of Communication
Segment III	The Communication Process (Receiver and Barriers)
Segment IV	The Communication Process (Sender and Feedback)
Segment V	Formal Communication and Its Dimensions
Segment VI	Informal Communication
Segment VII	Communication Under Battle Situations

PART FIVE: Military Management

Segment I	Introduction to Management and the Management Process
Segment II	Decision Making and Creativity
Segment III	Objectives
Segment IV	Planning
Segment V	Organizing: Principles and Process
Segment VI	Organizing: Structure
Segment VII	Organizing: Charting
Segment VIII	Directing
Segment IX	Controlling
Segment X	Coordinating

APPENDIX A
Continued

PART SIX: Authority and Responsibility

Segment I	Concept of Authority
Segment II	Why People Accept/Resist Authority
Segment III	Delegation of Authority; Line-Staff Relationship
Segment IV	Responsibility

PART SEVEN: Leadership Behavior and Style

Segment I	Leadership Behavior
Segment II	Leadership Style
Segment III	Determiners of Leadership Style - The Leader
Segment IV	Determiners of Leadership Style - The Group and The Situation
Segment V	Participative Leadership

PART EIGHT: Senior-Subordinate Relationships

Segment I	Organizational Structure & Social Distance in Senior-Subordinate Relationships
Segment II	Officer-Enlisted Relationships
Segment III	Assumption of Command and Formal & Informal Leader Relationships
Segment IV	Introduction to Counseling
Segment V	The Counseling Process
Segment VI	Relations with Seniors and Contemporaries

PART NINE: Morale - Esprit de Corps

Segment I	Morale
Segment II	Group Solidarity and Esprit

PART TEN: Discipline

Segment I	Introduction to Discipline
Segment II	Development and Maintenance of Discipline

PART ELEVEN: Personnel Evaluation

Segment I	The Role of Evaluation
Segment II	Enlisted Performance Evaluation
Segment III	Officer Evaluation

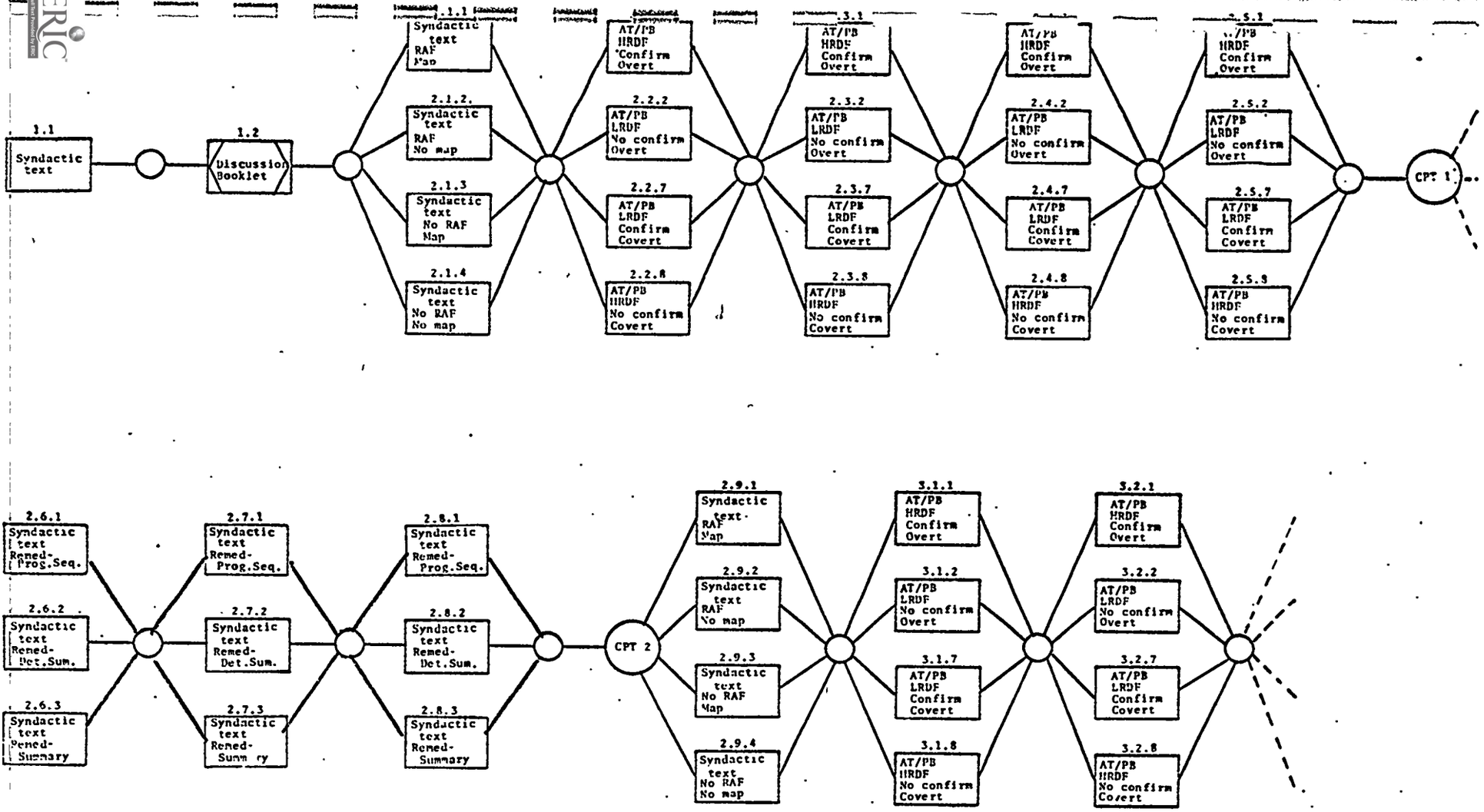
PART TWELVE: Applied Leadership

Segment I	Measurement of Effective Leadership
Segment II	Generally Recognized Characteristics of an Effective Leader
Segment III	Techniques of Assuming Command
Segment IV	"That's an Order!"

APPENDIX B

PRESENTATION DESIGN

FALL OF 1970 IMPLEMENTATION



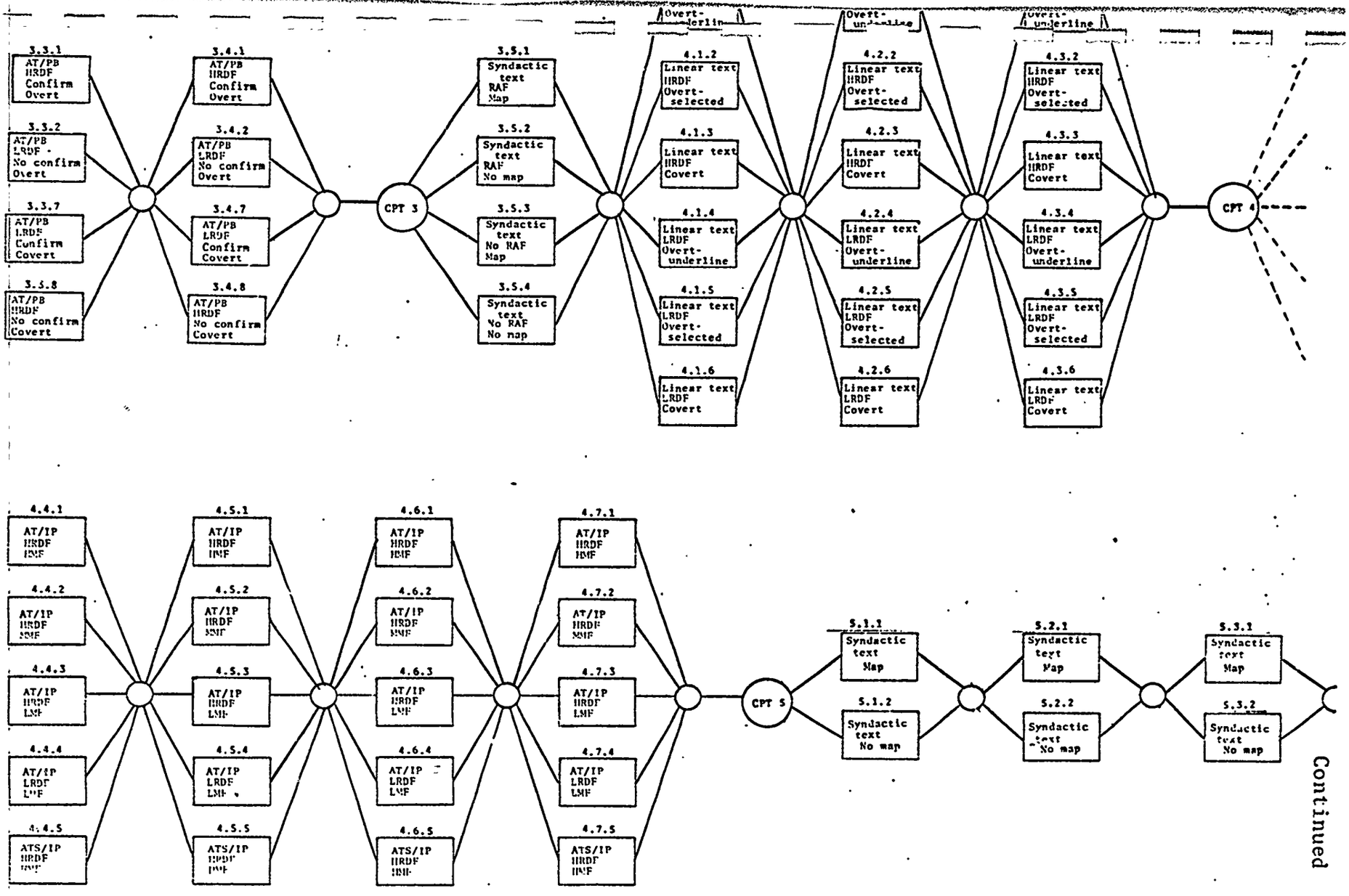
AT/IP = Audiotape/Intrinsic Program
ATS/IP = Audiotape Script/Intrinsic Program
AT/PB = Audiotape/Panelbook
ATS/PB = Audiotape Script/Panelbook
CAI = Computer Assisted Instruction

CAIS/IP = Computer Assisted Instruction Script/Intrinsic Program
CPT = Cumulative Posttest
Confirm = Confirmation
HMF = High Management Frequency

HRDF = High Response Demand Frequency
LMF = Low Management Frequency
LRDF = Low Response Demand Frequency
MMF = Medium Management Frequency
RAF = Revealed Answer Form
Remed = Remediation

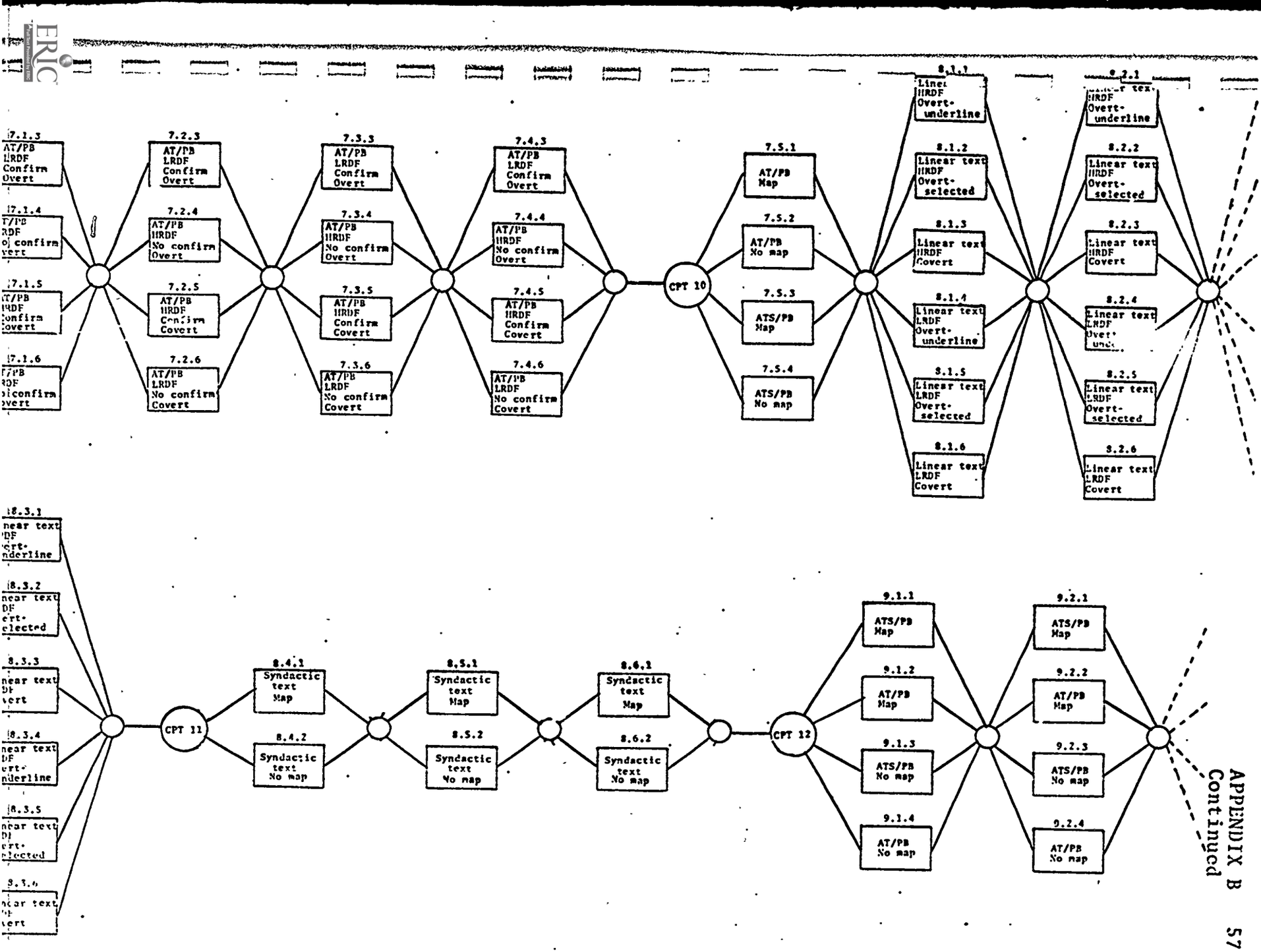
○ = Progress Check

APPENDIX B
Continued

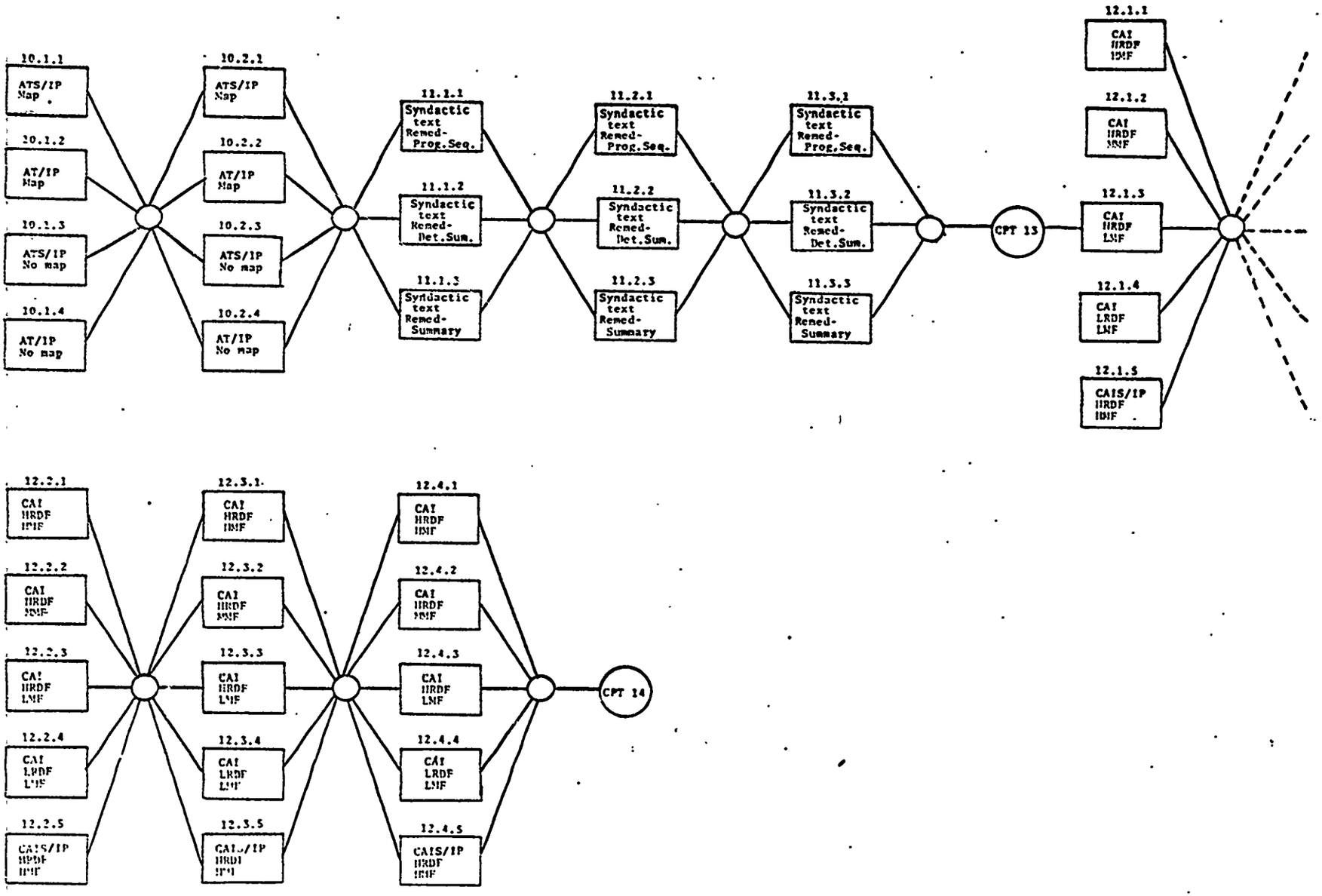

3.3.1
AT/PB
HRDF
Confirm
Overt
3.3.2
AT/PB
LRDF -
No confirm
Overt
3.3.7
AT/PB
LRDF
Confirm
Covert
3.3.8
AT/PB
HRDF
No confirm
Covert
3.4.1
AT/PB
HRDF
Confirm
Overt
3.4.2
AT/PB
LRDF
No confirm
Overt
3.4.7
AT/PB
LRDF
Confirm
Covert
3.4.8
AT/PB
HRDF
No confirm
Covert
CPT 3
3.5.1
Syndactic
text
RAF
Map
3.5.2
Syndactic
text
RAF
No map
3.5.3
Syndactic
text
No RAF
Map
3.5.4
Syndactic
text
No RAF
No map
Overt-
4.1.2
Linear text
HRDF
Overt-
selected
4.1.3
Linear text
HRDF
Covert
4.1.4
Linear text
LRDF
Overt-
underline
4.1.5
Linear text
LRDF
Overt-
selected
4.1.6
Linear text
LRDF
Covert
Overt-
4.2.2
Linear text
HRDF
Overt-
selected
4.2.3
Linear text
HRDF
Covert
4.2.4
Linear text
LRDF
Overt-
underline
4.2.5
Linear text
LRDF
Overt-
selected
4.2.6
Linear text
LRDF
Covert
Overt-
4.3.2
Linear text
HRDF
Overt-
selected
4.3.3
Linear text
HRDF
Covert
4.3.4
Linear text
LRDF
Overt-
underline
4.3.5
Linear text
LRDF
Overt-
selected
4.3.6
Linear text
LRDF
Covert
CPT 4
4.4.1
AT/IP
HRDF
HMF
4.4.2
AT/IP
HRDF
HMF
4.4.3
AT/IP
HRDF
LMF
4.4.4
AT/IP
LRDF
LMF
4.4.5
ATS/IP
HRDF
HMF
4.5.1
AT/IP
HRDF
HMF
4.5.2
AT/IP
HRDF
HMF
4.5.3
AT/IP
HRDF
LMF
4.5.4
AT/IP
LRDF
LMF
4.5.5
ATS/IP
HRDF
HMF
4.6.1
AT/IP
HRDF
HMF
4.6.2
AT/IP
HRDF
HMF
4.6.3
AT/IP
HRDF
LMF
4.6.4
AT/IP
LRDF
LMF
4.6.5
ATS/IP
HRDF
HMF
4.7.1
AT/IP
HRDF
HMF
4.7.2
AT/IP
HRDF
HMF
4.7.3
AT/IP
HRDF
LMF
4.7.4
AT/IP
LRDF
LMF
4.7.5
ATS/IP
HRDF
HMF
CPT 5
5.1.1
Syndactic
text
Map
5.1.2
Syndactic
text
No map
5.2.1
Syndactic
text
Map
5.2.2
Syndactic
text
No map
5.3.1
Syndactic
text
Map
5.3.2
Syndactic
text
No map

Continued

CPT 6
CPT 7
CPT 8
CPT 9
Linear text HRDF Overt-underline
Linear text HRDF Overt-selected
Linear text HRDF Covert
Linear text LRDF Overt-underline
Linear text LRDF Overt-selected
Linear text LRDF Covert
AT/PB LRDF Confirm Overt
AT/PB HRDF No confirm Overt
AT/PB HRDF Confirm Covert
AT/PB LRDF No confirm Covert
Syndactic text Reqed-Prog.Seq.
Syndactic text Reqed-Det.Sum.
Syndactic text Reqed-Summary
Syndactic text RAF Map
Syndactic text RAF No map
Syndactic text No RAF Map
Syndactic text No RAF No map



APPENDIX B
Continued


10.1.1
ATS/IP Map
10.1.2
AT/IP Map
10.1.3
ATS/IP No map
10.1.4
AT/IP No map
10.2.1
ATS/IP Map
10.2.2
AT/IP Map
10.2.3
ATS/IP No map
10.2.4
AT/IP No map
11.1.1
Syndactic text Remed-Prog.Seq.
11.1.2
Syndactic text Remed-Det.Sum.
11.1.3
Syndactic text Remed-Summary
11.2.1
Syndactic text Remed-Prog.Seq.
11.2.2
Syndactic text Remed-Det.Sum.
11.2.3
Syndactic text Remed-Summary
11.3.1
Syndactic text Remed-Prog.Seq.
11.3.2
Syndactic text Remed-Det.Sum.
11.3.3
Syndactic text Remed-Summary
CPT 13
12.1.1
CAI HRDF IMF
12.1.2
CAI HRDF IMF
12.1.3
CAI HRDF LMF
12.1.4
CAI LRDF LMF
12.1.5
CAIS/IP HRDF IMF
12.2.1
CAI HRDF IMF
12.2.2
CAI HRDF IMF
12.2.3
CAI HRDF LMF
12.2.4
CAI LRDF LMF
12.2.5
CAIS/IP HRDF IMF
12.3.1
CAI HRDF IMF
12.3.2
CAI HRDF IMF
12.3.3
CAI HRDF LMF
12.3.4
CAI LRDF LMF
12.3.5
CAIS/IP HRDF IMF
12.4.1
CAI HRDF IMF
12.4.2
CAI HRDF IMF
12.4.3
CAI HRDF LMF
12.4.4
CAI LRDF LMF
12.4.5
CAIS/IP HRDF IMF
CPT 14

Continued

Time (minutes) spent on the material excluding the instructions and progress check:_____.

For the following questions circle the appropriate number.

	High	Above Avg.	Avg.	Below Avg.	Low
Was the material interesting?	1	2	3	4	5
Was the material difficult?	1	2	3	4	5
Rate your approval of the way the material was presented (i.e. syndactic text, audiotape, etc.)	1	2	3	4	5
Many points were illustrated by military examples. Rate your assessment of their instructional effectiveness.	1	2	3	4	5

	Too Many	About Right	Too Few
How did you feel about the quantity of military examples used?	1	2	3

Did you feel that there were any sections of the materials that were unduly repetitious?_____

If you answered yes to the above question, please specify the section(s) by page number.

_____

If you have any additional statements to make about any of the above questions, please write the question number and make your comment here.

_____

_____

_____

What suggestions would you have for improving this segment?

_____

_____

_____

APPENDIX D

Mean Progress Check Performance (Before Remediation) By Module Studied

Audiotape/Intrinsically Programed Booklet Audiotape Script/Intrinsically Programed Booklet

Segment Number	Total Segment Perform-ance	Mod. 1 Tape HRDF HMF	Mod. 2 Tape HRDF MMF	Mod. 3 Tape HRDF LMF	Mod. 4 Tape LRDF LMF	Mod. 5 Script HRDF HMF
4.4	95	96	94	98	96	91
4.5	95	97	97	90	94	96
4.6	90	90	90	92	84	91
4.7	90	92	90	91	90	89
Mean	93	94	93	93	91	92

Mean for all tape modules = 93

Mean for all script modules = 92

Computer Assisted Instruction (CAI) CAI Script/Intrinsically Programed Booklet

Segment Number	Total Segment Perform-ance	Mod. 1 CAI HRDF HMF	Mod. 2 CAI HRDF MMF	Mod. 3 CAI HRDF LMF	Mod. 4 CAI LRDF LMF	Mod. 5 Script/IPB HRDF HMF
12.1	93	93	90	95	93	96
12.2	82	81	83	81	85	78
12.3	93	97	91	89	09	92
12.4	83	87	81	78	85	82
Mean	88	90	86	86	90	87

Mean for all CAI modules = 88

Mean for all CAI script modules = 87

APPENDIX D
Continued

Audiotape/Intrinsically Programed Booklet
Audiotape Script/Intrinsically Programed Booklet

Segment Number	Total Segment Performance	Mod. 1 Script Content Map	Mod. 2 Tape Content Map	Mod. 3 Script No Content Map	Mod. 4 Tape No Content Map
10.1	95	93	93	99	96
10.2	91	90	93	88	95
Mean	93	92	93	94	96

Mean for all tape modules = 95
Mean for all script modules = 93
Mean for all modules with content maps = 93
Mean for all modules without content maps = 95

Audiotape/Panelbook
Audiotape Script/Panelbook

Segment Number	Total Segment Performance	Mod. 1 Tape Content Map	Mod. 2 Tape No Content Map	Mod. 3 Script Content Map	Mod. 4 Script No Content Map
7.5	83	80	84	85	83
9.1	91	93	91	92	89
9.2	91	92	92	92	88
Mean	88	88	89	90	87

Mean for all tape modules = 89
Mean for all script modules = 89
Mean for all modules with content maps = 89
Mean for all modules without content maps = 88

APPENDIX D
Continued

Audiotape/Panelbook

Seg. No.	Total Seg. Perf.	Mod.1 HRDF Conf. Overt	Mod.2 LRDF No Conf. Overt	Mod.3 LRDF Conf. Overt	Mod.4 HRDF No Conf. Overt	Mod.5 HRDF Conf. Covert	Mod.6 LRDF No Conf. Covert	Mod.7 LRDF Conf. Covert	Mod.8 HRDF No Conf. Covert
2.2	86	93	85					76	85
2.3	70	73	69					65	72
2.4	78	78	77					78	80
2.5	90	88	88					93	91
3.1	73	75	73					75	69
3.2	80	77	84					77	79
3.3	70	72	73					69	68
3.4	87	85	88					88	88
5.7	83			84	80	85	85		
5.8	90			93	88	93	88		
5.9	79			71	87	82	75		
5.10	90			90	88	91	92		
7.1	81			84	83	79	78		
7.2	87			86	86	92	85		
7.3	80			79	79	85	79		
7.4	78			73	80	81	80		
Mean	81	80	80	83	84	86	83	78	79

Mean for all HRDF modules = 82

Mean for all LRDF modules = 81

Mean for all modules having confirmation = 82

Mean for all modules having no confirmation = 82

Mean for all modules with overt response = 82

Mean for all modules with covert response = 82

APPENDIX D
Continued

Syndactic Text

Segment Number	Total Segment Performance	Mod. 1 Remed. Program Sequence	Mod. 2 Remed. Detailed Summary	Mod. 3 Remed. Summary
2.6	82	78	80	85
2.7	72	76	68	74
2.8	86	86	85	88
6.1	90	93	88	90
6.2	85	89	86	80
6.3	88	88	88	90
11.1	82	85	81	80
11.2	93	95	93	90
11.3	90	95	88	87
Mean	85	87	84	85

Syndactic Text (Remed. - Programed Sequence)

Segment Number	Total Segment Performance	Mod. 1 Map	Mod. 2 No Map
5.1	89	89	89
5.2	76	77	75
5.3	92	93	90
8.4	94	93	95
8.5	87	86	88
8.6	87	88	85
Mean	88	88	87

APPENDIX D
Continued

Syndactic Texts (Remed. - Programed Sequence)

Segment Number	Total Segment Performance	Mod. 1 RAF Map	Mod. 2 RAF No Map	Mod. 3 No RAF Map	Mod. 4 No RAF No Map
2.1	88	88	87	88	86
2.9	90	90	86	92	90
3.5	93	94	93	95	92
6.4	87	90	87	85	88
Mean	90	91	88	90	89

Mean for all modules with RAF's = 90

Mean for all modules without RAF's = 90

Mean for all modules with content maps = 91

Mean for all modules without content maps = 89

Map=Content Map

RAF=Revealed Answer Form

Linear Texts

Segment Number	Total Segment Perform-ance	Mod. 1 HRDF Overt Under-line	Mod. 2 HRDF Overt Selected	Mod. 3 HRDF Covert	Mod. 4 LRDF Overt Under-line	Mod. 5 LRDF Overt Selected	Mod. 6 LRDF Covert
4.1	92	95	91	84	98	93	93
4.2	95	99	94	96	93	94	94
4.3	84	85	84	87	85	83	83
5.4	84	83	84	86	77	87	85
5.5	82	79	89	80	78	80	84
5.6	82	86	84	83	78	80	83
8.1	87	89	83	90	87	86	88
8.2	91	91	91	93	91	90	93
8.3	92	96	96	85	91	94	88
Mean	88	89	88	87	86	87	88

Mean for all HRDF modules = 88

Mean for all LRDF modules = 87

Mean for all overt-underline modules = 88

Mean for all overt-selected modules = 88

Mean for all covert modules = 88