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ANALYSIS REPORT 05C10(U) PERSPECTIVE INSTRUCTIONAL
COMMUNICATIONS INC SAN DIEGO CA 18 JUN 82
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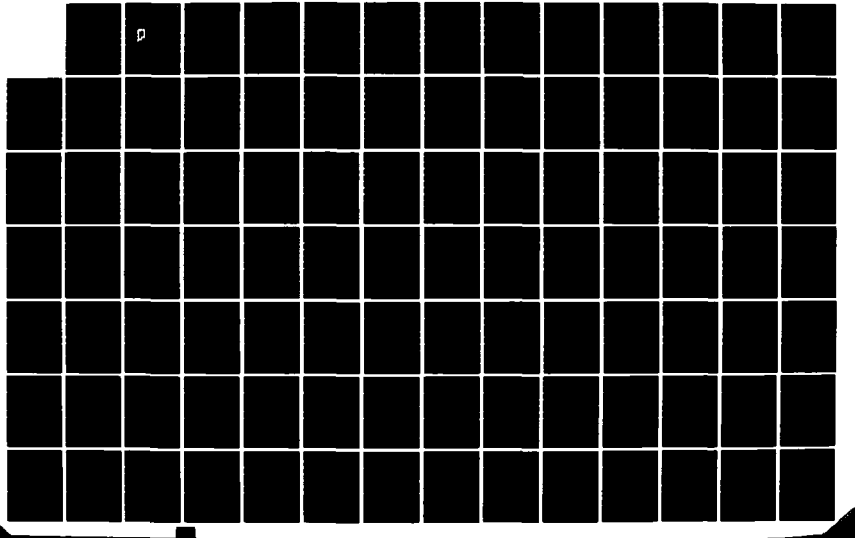

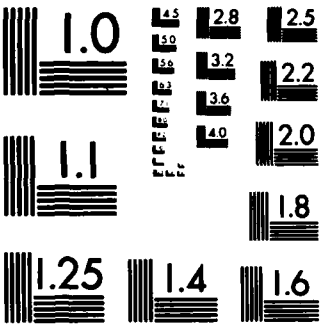

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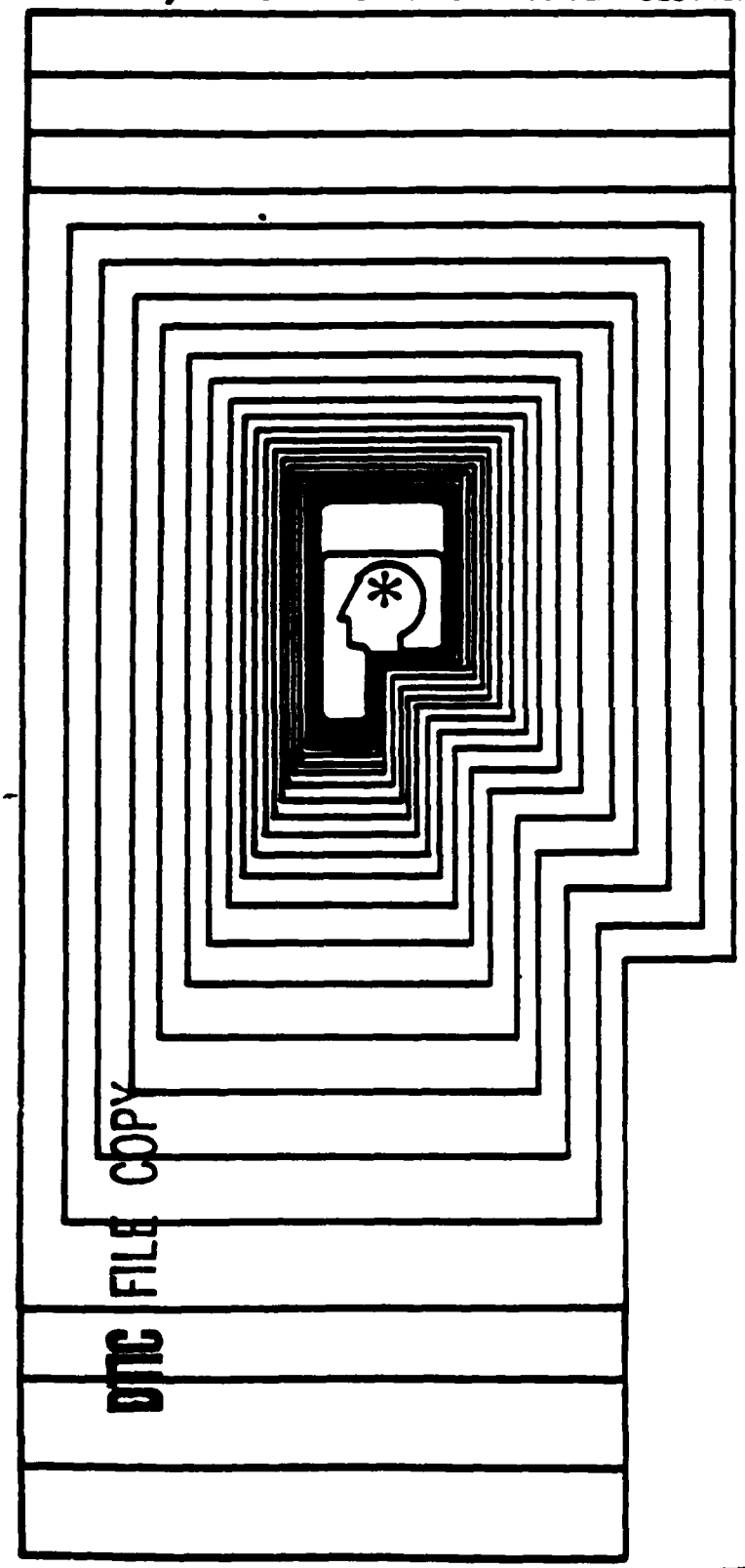

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05C10 FUNCTIONAL BSEP ANALYSIS REPORT

18 JUNE 1982

CONTRACT DABT60-81-C-0027

CDRL NUMBER A006

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER	2. GOVT ACCESSION NO. / 3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)*: 05C10 Functional Basic Skills Education Program Analysis Report	5. TYPE OF REPORT & PERIOD COVERED: Analysis Report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): Perspective Instructional Communications	8. CONTRACT OR GRANT NUMBER(s): DABT 60-81-C-0027
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Perspective Instructional Communications, 3510 Dunhill Street, San Diego, CA 92121	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS: Training Developments Institute, ATTN: ATTG-DOR, Fort Monroe, VA 23651	12. REPORT DATE: 18 Jun 82 13. NUMBER OF PAGES: 98
14. MONITORING AGENCY NAME & ADDRESS *(if different from Controlling Office)*	15. SECURITY CLASS. *(of this report)*: UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Basic skills
Prerequisite competencies
Functional basic skills
Remediation
Analysis
Selecting training tasks

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

The analysis report for the development of a function basic skills education program for radio teletype operators describes how the decisions on what to teach were made. The prerequisite competencies selected for training and not selected for training are discussed as is the rationale for selection. Relationships of prerequisite competencies and course learning objectives and interrelationships among these competencies are discussed. Method and procedures are described. Principal finding and difficulties encountered are reported. See also interim analysis report.

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ANALYSIS REPORT

This document completes the report of the analysis of the 05C AIT Course. It constitutes a supplement to the Interim Analysis Report dated 25 November 1981.

1. CONTRACT SPECIFICATIONS

The contract (DABT60-81-C-0027) specifies that the analysis report should describe the "prerequisite competency skills selected for training." It states that, the analysis report should contain the following elements:

1. Prerequisite competencies selected for training
2. Prerequisite competencies not selected for training
3. The rationale for selection
4. The relationship of prerequisite skills with 05C10 course learning objectives
5. The interrelationships of the prerequisite skills
6. The results of the verification of the selected skills
7. The methodology and the procedure employed in performing the analysis
8. The principal findings and any difficulties encountered

Each of these elements will now be discussed with reference being made to the Interim Analysis Report if the information is found in that document. Information found in the Interim Analysis Report will not be repeated here.

Information regarding certain elements was included in the Design Report of 18 December 1981. When this occurs, the information will be summarized here. The reader can refer to the Design Report for a more detailed discussion of methodology and findings.

Before discussing each of the elements cited above, we will note and discuss changes that should be made in the Interim Analysis Report.

2. CHANGES IN INTERIM ANALYSIS REPORT

Rules for Local Duplex Operations on AN/GRC-122

The outline showing the recommended structure for lesson M-02[1] was modified as shown below:

Original version:

M2.8.1 Duplex RT must have minimum 1 MHz or 10% separation from transmitting frequency, whichever is greater.

*M2.8.1.1 Find 10% of a number having metric prefix

*M2.8.1.2 Know fact: purpose is to prevent overlap of signals

Revised version:

M2.8.1 Determine the frequency for the duplex RT

*M2.8.1.1 Obtain the duplex frequency from the CEOI

M2.8.1.2 Know fact: Duplex RT must have a minimum of 1 MHz or 10% separation from the transmitting frequency, whichever is greater.

*M2.8.1.2.1 Find 10% of the trams-mitting frequency

*M2.8.1.2.2 Compare 10% of a frequency with the number 1

*M2.8.1.2.3 Find the frequencies which are 10% above and 10% below the transmitting frequency

[1] Install, adjust, transmit and receive messages using Radio Teletypewriter Set AN/GRC-142 and AN/GRC-122 in normal remote and duplex operation.

*M2.8.1.2.4	Compare the duplex frequency obtained from the CEOI with the frequencies which are 10% above and 10% below the transmitting frequency
*M2.8.1.2.5	Know fact: If the duplex frequency from the CEOI does not meet the minimum separation, notify your supervisor
*M2.8.1.2.6	Know fact: The purpose of the minimum separation is to prevent the overlap of signals

The need for the change was prompted by the receipt of more detailed information from subject matter experts at the Signal School. The effect of the change, as far as prerequisite competencies are concerned, is to add two basic skill procedures to the list of candidates for the FBSEP, items M2.8.1.2.2 and M2.8.1.2.4. The other changes have implication for the 05C AIT Course but not for the FBSEP.

Other Changes

The fourth sentence of the second paragraph on page 4 should read as follows: "Some examples of prerequisite skill procedures are...

3. PREREQUISITE COMPETENCIES SELECTED FOR TRAINING

The selection of prerequisite competencies for training requires three operations. First, on the basis of an analysis of the content of the 05C AIT Course lessons, prepare a tentative list of knowledge and skills which may constitute prerequisites for specific 05C AIT Course lessons. These first level prerequisites are sometimes called "component," (Okey, 1973). A description of the knowledges and skills so identified, the rationale for selection, and the methodology and procedure followed, are contained in the Interim Analysis Report.

Second, analyze the prerequisite knowledges and skills derived in step #1 and identify knowledge and skills which may constitute prerequisites to the knowledge and skills derived in step #1. Continue this process of developing successively lower levels of prerequisites until a point is reached where it is felt that most students will already possess the knowledge and skills required to perform the next higher task. The result of this process is a learning hierarchy. A description of the learning hierarchies so developed, the knowledge and skills comprising each hierarchy, the rationale, and the methodology and procedure followed, are contained in the Design Report.

Third, cluster individual knowledge and skills (those not part of a hierarchy) and learning hierarchies into modules. The prerequisites identified in steps #1 and #2 were clustered into

four modules, study skills, language, reading, and math. The specific knowledge, skills and learning hierarchies assigned to each module are found in the Design Report.

Fourth, determine if the knowledge, skills, and learning hierarchies developed by logical analysis in steps #1 and #2 are valid and are supported by data. This is accomplished by developing tests to measure each prerequisite knowledge and skill, administering these tests to students enrolled in the 05C AIT Course, collecting students' scores on 05C AIT lesson tests, analyzing student scores on individual tests and determining the relationship between test scores.

The analysis of student scores on the test used to measure prerequisite knowledge and skills affords an opportunity to verify the retention (or exclusion) of the knowledge and skills tentatively selected for inclusion in steps #1 and #2. If a significant number of students representative of the target population do poorly on items designed to test a particular knowledge or skill, that is evidence for retaining the knowledge or skill in the FBSEP. If, on the other hand, a significant number of students representative of the target population do well on items designed to test a particular knowledge or skill, that is evidence for dropping the knowledge or skill from the FBSEP.

Test items were prepared for all of the knowledge and skills identified in steps #1 and #2 and the test was administered to a sample of students prior to their receiving any instruction in the 05C AIT Course. A criterion of 95% correct was established because the students to which the test was administered had higher aptitude scores than the target population. If 95% or more of the students answered questions related to a particular knowledge or skill correctly, that knowledge or skill was deleted from the list. Conversely, if less than 95% of the students answered the questions correctly the knowledge or skill was retained.

Using the 95% criterion, only three prerequisites were dropped from the list of prerequisites tentatively selected for inclusion in the FBSEP. The three, all math skills, were:

Deciding if a number is greater than 1
Comparing the value of two numbers
Deciding if a number is between two other numbers

The corresponding FBSEP lessons were, consequently, dropped from the roster. Since these skills, none the less, are prerequisite for an AIT task, a brief explanation of them was incorporated in another FBSEP lesson. Included is their connection with the appropriate AIT task and with other related FBSEP math skills.

The presentation also includes a few examples and their answers and has a direction to the student that if he does not understand these examples to see his learning supervisor for assistance.

4. THE RELATIONSHIP OF PREREQUISITE SKILLS WITH 05C10 LEARNING OBJECTIVES

The relationship of prerequisite skills with 05C10 learning objectives can be looked at in three ways. The first way is in terms of logical analysis. The analyst, after examining lesson materials and interviewing the faculty, hypothesizes that certain knowledge and skills constitute prerequisites for a particular lesson. The second way is in terms of statistical relationship. The analyst prepares tests to measure the incidence of the prerequisite knowledge and skills and relates student's scores on these tests to student's scores on lesson tests. The third way is in terms of practical effect. The analyst prepares training materials to correct deficiencies in prerequisite knowledge and skills and then determines the impact that such remedial training has on lesson tests.

The results of the first approach is described in this section of the Analysis Report. The results of the second approach will be described in the section of this report titled Results of the Verification of Basic Skills. The results of the third approach will be examined at a later point in time, after the basic skills lesson have been implemented. This will take place some time after the present contract is completed.

A discussion and table describing the relationship between prerequisite knowledges and skills with 05C10 lessons appears in the Design Report. It should be noted that there have been

minor changes in the prerequisites since the publication of the Design Report and that the relationships shown in the Design Report are based on logical analysis rather than statistical data. Table 6 of the Development Report shows the updated relationship between FBSEP lessons and 05C AIT lessons.

Table 1, based on information in the Design Report, shows the distribution, by 05C AIT lesson, of those prerequisite knowledges and skills which are lesson specific, that is, excluding those prerequisites, such as reading, which apply to all lessons. For examples, 05C AIT Lessons H-02 and M-02 each had 12 prerequisites. Lesson L-01, on the other hand, had no prerequisites.

TABLE 1

DISTRIBUTION OF LESSON SPECIFIC PREREQUISITES

BY 05C AIT LESSONS

NUMBER OF PREREQUISITES	05C AIT LESSON
12	H-02 and M-02
11	N-02
10	H-01 and J-01
9	J-02
8	K-01 and M-03
7	J-01, J-03, N-01, N-03, and N-04
6	H-05 and N-05
5	K-02 and N-06
4	H-03
3	H-04, H-06, and M-01
2	F-02
1	L-02 and L-03
0	L-01

Table 2, also based on data in the Design Report, shows the distribution of 05C AIT lessons by lesson specific prerequisites. As can be seen in the table, the number of lessons supported by a prerequisite ranged from 14 to 1. The most frequent prerequisites are the following.

NOTE: Prerequisite identification numbers and titles shown are not those in Design Report, but those in current use.

B-33*	Match text with equipment	14 lessons
B-08	Find information in illustration	12 lessons
B-31	Find information in illustration using related text	12 lessons
B-32	Identify parts of equipment using labeled illustration	12 lessons
B-33	Perform a procedure using related illustration/text	12 lessons
B-09	Find information in tables	11 lessons

TABLE 2

DISTRIBUTION OF 05C AIT LESSONS BY LESSON SPECIFIC PREREQUISITES

NUMBER OF 05C AIT LESSONS	PREREQUISITES
14	B-09*
12	B-08, B-31, B-32, B-33
11	B-09
9	A-09
7	B-07
6	C-01
5	C-05/C-07
4	C-09
3	A-06, A-07, A-08, A-09,
2	B-04, B-05, B-10, B-28, B-29, B-30, C-02, C-03, C-04
1	B-03, B-05, B-11, C-07, C-10, D-01, D-02, D-03, D-04, D-05, D-06, D-06*, D-07, D-07*, D-08, D-09, D-10, D-12, D-13, D-14

*This prerequisite was listed in the Design Report as B-09. It is now incorporated in B-33, Performing a Procedure Using Illustration/Text.

5. THE INTERRELATIONSHIPS OF THE BASIC SKILLS

The interrelationship of basic skills can often be portrayed by learning hierarchies in which tasks are arranged to show a prerequisite relationship. Immediately beneath each task and connected to it with a line, the analyst shows those tasks which are prerequisites, that is, the knowledge and/or skills which individuals must have in their repertoire in order to perform the task immediately above in the learning hierarchy. The procedure normally is continued until the analyst has identified all knowledge and skills on which the target population is suspected to be deficient.

Theory

The first set of learning hierarchies are based on the judgements of the analyst who examines the terminal task to determine its prerequisite and then analyses each prerequisite (enabling) task to determine their prerequisites. Invariably these learning hierarchies are revised. Some revisions are based on the judgement of lesson writer and test writers who realize that certain necessary knowledge and skills have been overlooked or that other knowledge and skills are superfluous. Other revisions are based on data secured by administering tests designed to measure the presence or absence of the knowledge and skills in the target population. These tests may precede or follow training on the knowledge and skills in the learning hierarchy.

The advisability of including or excluding a particular knowledge or skill in a learning hierarchy can be looked at in an absolute sense or relative to the task for which it may be a prerequisite. If the test scores indicate that many students have the knowledge or skill under consideration, there is little merit in including it in the learning hierarchy. If, on the other hand, many students do not have the knowledge or skill, it probably should be included in the learning hierarchy. Low scores also should prompt the analyst to carefully examine the knowledge or skill to determine if it has prerequisites, the mastery of which would facilitate performance on the first knowledge or skill. The criterion of what constitutes "have" or "do not have," is a matter of judgement.

The interrelation of knowledge and skills, as shown by test scores, also can be used as a basis for inclusion or exclusion. If a true prerequisite relationship exists, test scores should show a positive relationship between a knowledge or skill and its prerequisites. Scores on a prerequisite knowledge or skill should be equal or higher than scores on the knowledge or skill for which the first knowledge or skill is a prerequisite. There should be no instances where scores on a prerequisite knowledge or skill are lower than the scores on the knowledge or skill for which it is a prerequisite.

If a positive relationship exists between two knowledge/skills, this is an argument for their retention and for the hypothesized prerequisite relationship. If there is no relationship between the two knowledge/skills, this is an argument for exclusion. If the relationship is negative, this is an argument for reversing their relationship.

Two cautions should be kept in mind when using test scores as a basis for identifying prerequisites and establishing learning hierarchies. First, test development should follow established test development procedures. Second, care should be taken to insure that test will be sensitive to whatever prerequisite relationship does exist between the knowledge and skills under consideration. If care is not taken, the prerequisite relationship may be masked or overlooked. An example of each, based on our experience in FBSEP may make these points clear.

Let us assume that the terminal task is to fill-out a form and that one of the prerequisites is "spelling military terms." Care must be taken to insure that the test that measures "filling out a form" considers the spelling of military terms on the form. If the test only considers that all entries are made and in the proper box on the form, the effect of the prerequisite will have been overlooked. Of course, the assumed prerequisite may not, in fact, be related to the high-order skill.

Critical factors cannot be overlooked in the area of math and this may account for the frequent finding that validated learning hierarchies are more evident in math than in other intellectual skills (Briggs, 1968 as cited by Okey, 1973). For example two prerequisites for long division are multiplication and subtraction and it is not possible to solve a long division problem without multiplying and subtracting numbers.

Here is an example where the prerequisite effect is masked. Let us assume that the terminal task is to find information in a publication and that two of the prerequisites are "using an index" and "using a table of contents." If the publication has but a few pages, the student can find the correct page by leafing through the document rather than by using the table of contents or index. Admittedly, the "leafing through" procedure would probably take more time but the test would be sensitive to this element only if time was taken into account when scoring this test item. A time limit for the test as a whole, assuming that it includes a variety of test items, would not be an adequate control of the time factor which would be critical for this type of a prerequisite relationship.

Failure to take "time" into account can also mask a prerequisite relationship in math. Let us assume that the terminal task is to solve a problem and then find 10% of the answer, and that one of the prerequisites is to find 10% of a number by moving the decimal point. The student can find 10% of the answer by

the laborious multiplication procedure rather than by moving the decimal point. Multiplication would take more time (and would be more prone to errors), but the test would not be sensitive to this fact unless the original problem was timed.

FBSEP

The first set of learning hierarchies for FBSEP basic skills appears in the Design Report. The basic skills were first put into four clusters (language, reading, study, and math) and then the skills within each cluster were arranged into learning hierarchies on the basis of the judgement of the analyst. In the course of preparing test items for a diagnotic test to measure the incidence of the knowledge and skills in the target population, some changes were made in the learning hierarchies included in the Design Report. These changes included adding a knowledge/skill, deleting a knowledge/skill, and changing the location in a learning hierarchy of a knowledge/skill. The Diagnostic Test was administered in the Verification run. The responses of 105 students in the Verification run were used to validate 20 of the hypothesized prerequisite relationships shown in the revised learning hierarchies. Of the twenty pairs of basic skills, eight dealt with reading skills, three with language skills, and nine with math skills. The data was analyzed by Horst (1982) using Chi Squares to test the significance of the relationship.

If a "true" hierarchical relationship exists, student performance on a prerequisite skill should be higher than on the higher order basic skill that it supports. This pattern was evident on two of the eight reading skill relationships, on two of the three language skill relationships, and on all nine of the math skill relationships.

Of the thirteen relationships in which student performance on a prerequisite skill was higher than on the skill for which it was a prerequisite, only three were statistically significant at the .05 level or better. The three, all math skills, are shown below.

Add or subtract hours moving across days

Add hours to military time

Find the numbers which are 10% above and 10% below a given number

Find 10% of a number

Divide the number 468 by a number containg a decimal and round off the answer to the nearest tenth.

Round off a number to the nearest tenth.

A number of factors may account for the lack of statistical support for the hypothesized hierarchical relationships. First, the number of test items was limited because only two hours were allocated for test administration. Of the 30 basic skills used in the analysis, ten were tested with but one item, six

with but two items, and eight with three items. The Diagnostic Test can be considered as a sample of the items that test the basic skills. For a more accurate test of the hierarchy, a more complete set of items should be used. For example, the hypothesized relationship between "find information in text" and "find information in table of contents" was not supported by data. The likely reason is that the "text" was not a publication but one and one-half pages from a publication. A table of contents would have been of little assistance in this situation. Second, in some cases, the test items used to measure a basic skill were very easy. The mean percent correct on thirteen of the thirty basic skills used in the analysis was 80% or better, in one instance reaching 99%. (In the Diognostic Test as a whole only 18 of the 100 multiple-choice items for a sample of 325 students showed more than 80% scoring correctly.) The easy test items were retained because it was felt that the 105 students used in the analysis had higher aptitude scores than will be true of students who are the eventual target of the FBSEP.

Third, reading skills, as has been noted earlier, generally do not form hierarchical relationships. Although in theory it would seem that knowing vocabulary would facilitate reading comprehension, it is also true that a reading passage provides context which facilitates comprehension even if some vocabulary is unfamiliar. This may account, for example, for the lack of a statistical relationship between "comprehend reading passage," and "match terms and their definition." It should be noted

here that none of the terms used in "matching" were used in the passage that the student was to comprehend. Also note that the present hierarchies do not relate these two skills in a hierarchical manner.

6. CHANGES IN THE LEARNING HIERARCHIES

As has been noted earlier, the learning hierarchies underwent a number of revisions in the course of the research and development effort. This section of the report will describe some of the revisions that were made and the rationale for the changes.

Language Skills

In the Design Report, "spell commonly used military terms" was shown as a prerequisite for "fill-out forms" and "write text of message presented orally." It's prerequisite relationship with "fill-out form" was deleted because in the test for "fill-out forms," the student is given printed copy which he then transfers to (enters on) blocks on the form. The ability to "spell" is not required.

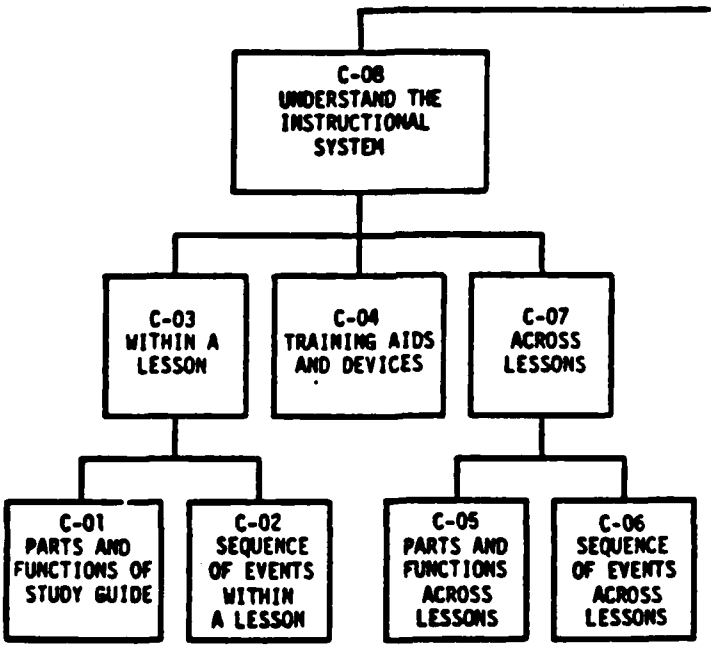
Reading Skills

In the Design Report, "match terms and their definitions," and "integrating information to form concepts," are both shown as prerequisite to "comprehend reading passages." "Match terms and their definitions" was removed from this learning hierarchy because it was felt that the general context of the reading passage would outweigh the effect of knowledge of terms and their definitions in having an impact on comprehension.

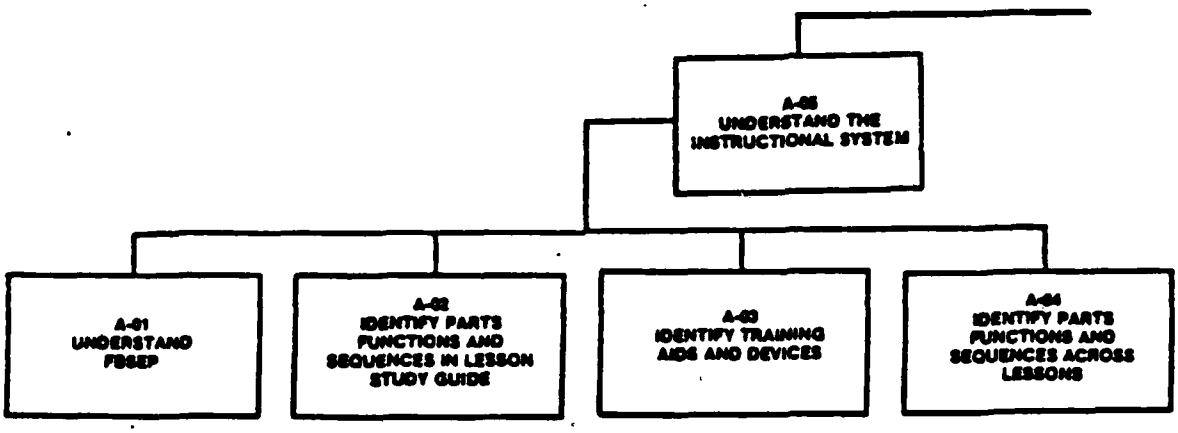
Note: There have been minor changes in the wording of basic skill titles and major changes in the identification letters/numbers assigned to basic skills between the Design Report and this Analysis Report.

Study Skills

In the Design Report, eight basic skills were arranged into a learning hierarchy as shown below. It was acknowledged, at the time, that it was not a "true" learning hierarchy, but rather a convenient way to group skills that are clearly related to one another. There was no intention of conducting training at C-03, C-07, or C-08. At these points in the hierarchy, the intent was to test only.



The above hierarchy was simplified into the one shown on the next page when it became apparent that skills C-01 and C-02 could conveniently be combined into one lesson and that skills C-05 and C-06 also could conveniently be combined into one lesson. On the other hand, "Understand FBSEP" was inserted in the learning hierarchy because it was felt that students needed an orientation to the remedial program in which they were participating.



Math Skills

In the Design Report, "divide the number 468 by a frequency" has two prerequisites, "multiply a frequency by a 1-digit number," and "subtract one number from another." Since the frequency (divisor) normally contains a decimal, the student was being taught how to divide decimal numbers before he was being taught how to divide numbers not containing decimals. To correct this weakness, a new task was inserted in the learning hierarchy, namely "divide 7-digit numbers by 6-digit numbers." The "multiply" and "subtract" tasks cited above were then shown as prerequisites to the new task, which, in turn, was shown as prerequisite to "divide the number 468 by a number containing a decimal."

It should also be noted that at one stage during lesson development, there were three additional math lessons dealing with the comparison of the value of numbers. As explained in the Development Report, further analysis showed these skills were not functional and, consequently, these lessons were dropped from the FBSEP schedule. The elimination of these lessons, however, did not alter the hierarchal order of the remaining math lessons.

A copy of each of the four revised annex maps follows. Each map reflects how the lessons within that annex are arranged in hierarchal order, demonstrating their interrelationship with enabling lessons and with higher level lessons.

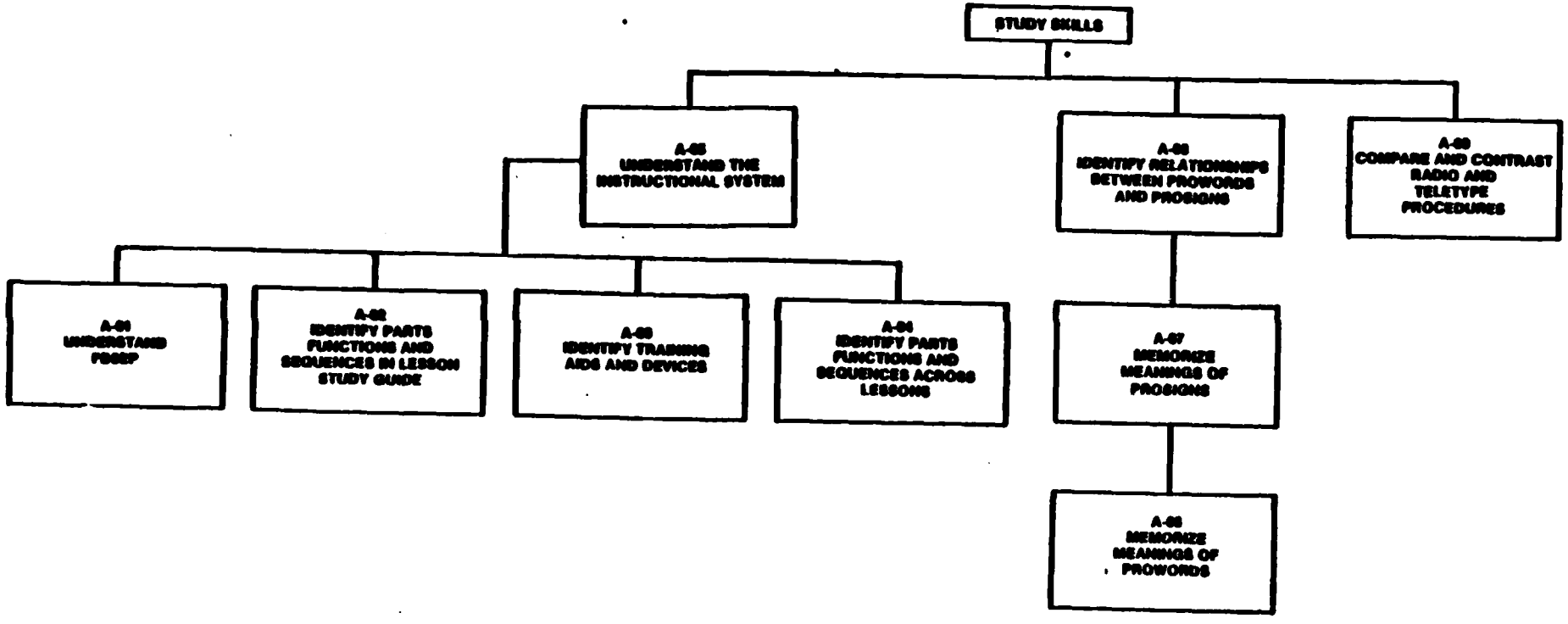


Figure 1. Learning Hierarchy, Annex A.

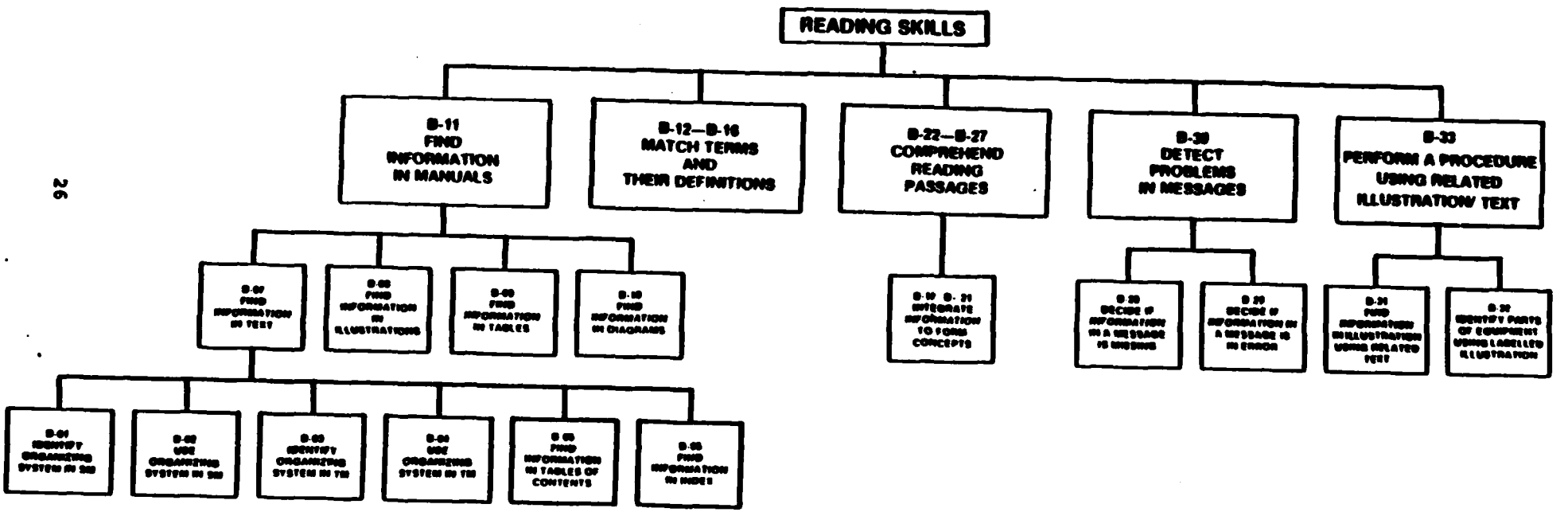


Figure 2. Learning Hierarchy, Annex B.

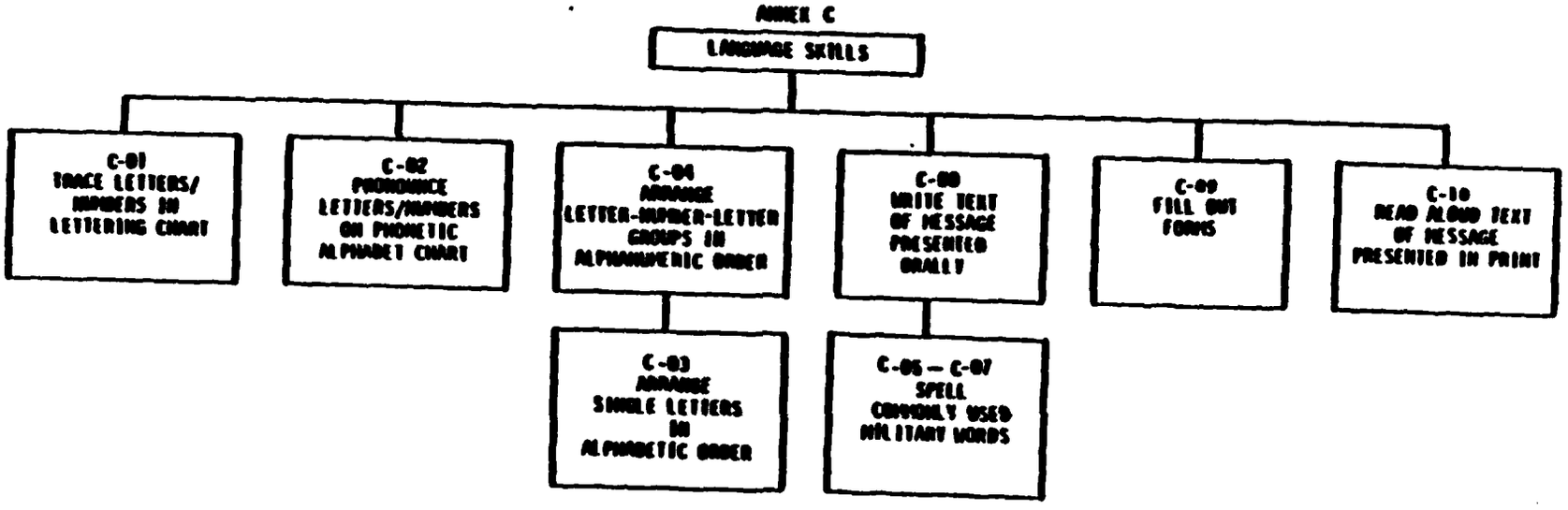


Figure 3. Learning Hierarchy, Annex C

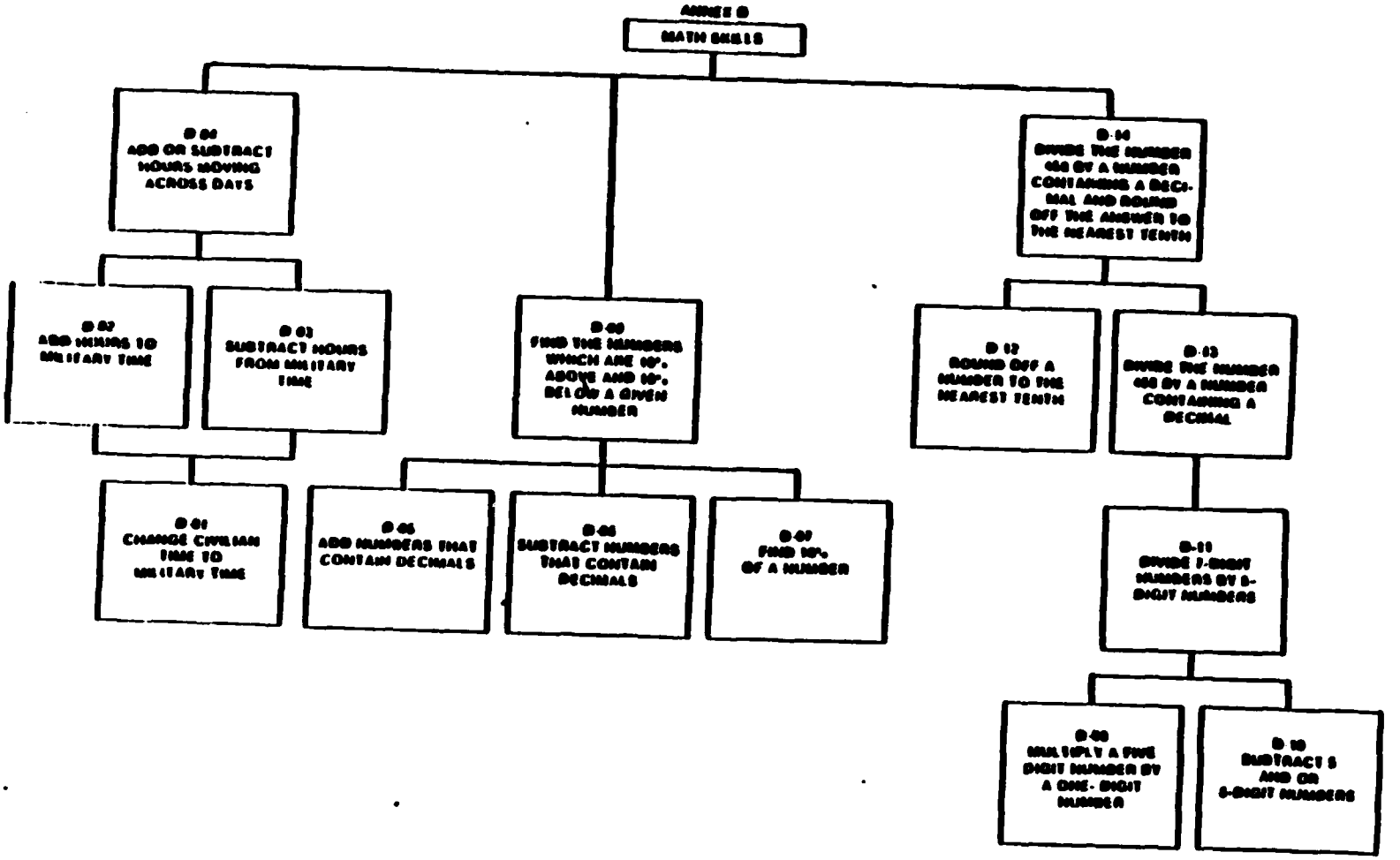


Figure 4. Learning Hierarchy, Annex D.

7. INCIDENTAL ACQUISITION AND RETENTION OF BASIC SKILLS

One of the major goals of the FBSEP effort was to identify basic knowledge and skills which constitute prerequisites for the technical knowledge and skills taught in the 05C AIT Course. The ultimate goal was to design a training program to impart these basic knowledge and skills to those students who may lack them, thus facilitating their progress through the 05C AIT Course.

If our initial identification of basic knowledge and skills is correct, if one must possess them in order to complete the course, then we must assume that students who complete the course have the prerequisite knowledge and skills. Prior to the implementation of FBSEP, the student could have acquired the prerequisite knowledge and skills in one of two ways. The student either brought them with him when he started the 05C AIT Course or he acquired them incidentally while undergoing training. In either case, the student would be expected to use the knowledge or skill in order to perform the technical tasks which constitute the 05C AIT Course. This "use" constitutes "practice" of the particular knowledge and skills. If our reasoning is correct student's scores on prerequisite knowledge and skills at the end of training (after incidental learning and required practice) should be higher than at the start of training (prior to incidental learning and required practice).

This hypothesized effect was measured by administering the Diagnostic Test twice to 47 students, first before they started the 05C AIT Course and again after they had graduated from the 05C AIT Course. The data is presented in Table 3. The text is shown for those test items in which the difference between before and after scores was 15% or greater.

TABLE 3

PERCENT CORRECT ON DIAGNOSTIC TEST ITEMS

BEFORE AND AFTER 05C AIT TRAINING

FOR 47 STUDENTS PRIOR TO THE IMPLEMENTATION OF FBSEP

TEST ITEM	PERCENT CORRECT BEFORE TRAINING	PERCENT CORRECT AFTER TRAINING	DIFFERENCE
Language Skills			
1	70	82	+12
2	87	85	- 2
3	91	97	+ 5
4 Arrange in alphanumeric order	55	70	+15
5 Arrange in alphanumeric order	48	70	+22
6 Arrange in alphanumeric order	63	87	+24
7	82	87	+ 5
8	61	72	+11
9	38	48	+10
10	59	50	- 9
11	68	74	+ 6
Math Skills			
12	85	82	- 3
13	87	82	- 5
14	91	91	0
15	95	95	0
16	76	89	+13
17	85	89	+ 4
18 Subtract hours & change days	68	85	+17
19	76	80	+ 4
20	89	89	0
21	80	93	+13
22	95	91	- 4
23	68	72	+ 4
24	51	51	0
25	46	48	+ 2
26	91	93	+ 2
27	82	76	- 6
28	78	80	+ 2
29	78	87	+ 9

TABLE 3 (cont'd.)

TEST ITEM		PERCENT CORRECT BEFORE TRAINING	AFTER TRAINING	DIFFERENCE
Math Skills (cont'd)				
33		76	72	- 4
34		76	74	- 2
35		68	68	0
36		51	48	- 3
37		65	68	+ 3
Reading Skills				
43	Fill-in gaps in outline format	48	68	+20
44		57	57	0
45		78	82	+ 4
46		61	59	- 2
47		65	63	- 2
48		78	76	- 2
49		59	68	+ 9
50		68	80	+12
51		63	63	0
52	Understand paragraph numbering system	70	85	+15
53	Use index in CEOI	91	74	-17
54		89	97	+ 8
55	Use table of contents in a TM	40	61	+21
56		76	85	+ 9
57		68	82	+14
58		78	76	- 2
59		34	29	- 5
60		95	87	- 8
61		100	93	- 7
62		76	70	- 6
63		82	70	-12
64		48	55	+ 7
65		93	89	- 4
66		78	82	+ 4
67	Find information in an illustration	57	78	+21
68		87	100	+13
69		93	95	+ 2
70		89	91	+ 2

TABLE 3 (cont'd)

TEST ITEM		PERCENT CORRECT BEFORE TRAINING	AFTER TRAINING	DIFFERENCE
Reading Skills				
71		65	72	+ 7
72		68	78	+10
73	Find information in trouble-shooting table	65	87	+22
74		78	93	+ 5
75	Find information in diagram	55	70	+15
76		72	76	+ 4
77		80	82	+ 2
78		87	74	- 7
79		74	85	+11
80		46	53	+ 7
81		29	38	+ 9
82		61	59	- 2
83		51	55	+ 4
84		36	38	+ 2
85	Identify definition of diameter	38	53	+15
86		55	61	+ 5
87	Identify definition of precedence	55	80	+15
88	Identify definition of deflection	59	74	+15
89	Find information in text re suffix	61	89	+28
90	Find information in text re suffix	70	95	+25
91		80	91	+11
92		72	80	+ 8
93		87	89	+ 2
94		63	76	+13
95		40	44	+ 4
96		38	51	+1
97	Find error in a message	31	47	+16
98		40	44	+ 4
99		57	47	-10
100		74	82	+ 8

Improvement was shown on 63 of the 92 test items for which data was available, though most of the differences are below 15%. A possible explanation of why more improvement is not evident is the "ceiling effect," that is, students who did well on the test before training had little room for improvement. Of the 17 items in which differences were 15% of greater, only one (#53) was in the unexpected direction; that is, students performed better before training than after training. We have no explanation for this reversal because students showed modest improvement on item #54 which posed a similar task.

An alternative explanation of the gains shown could be student familiarity with the test item because the same test items were used for both administrations. This seems unlikely since students received no feedback after the first administration, and approximately 11 weeks separated the two administrations of the Diagnostic Test.

Table 4 presents the same data, this time with test items arranged to show the FBSEP lesson which they support. For example, test items 43 and 44 support FBSEP lesson B-03.

TABLE 4

ANALYSIS OF PRE AND POSTTEST SCORES ON THE DIAGNOSTIC TEST FOR ITEMS AND ITEM CLUSTERS (BASED ON 47 STUDENTS)

Lesson No.	Diag. Test Item or Clusters	No. of Questions	Mean Pretest Score	Mean Posttest Score	No. of Students Increasing Score	No. of Students Decreasing Score or Remaining Same	t Ratio on Selected Pairs
B-03	43-44	2	1.19	1.25	16	31	
B-04	45-52	8	5.72	5.89	21	26	
B-05	53-56	4	3.02	3.44	16	31	
B-06	57-59	3	1.85	1.89	15	32	
B-07	60-62	3	2.72	2.51	4	43	
B-08	63-67	5	3.61	3.78	19	28	
B-09	68-73	6	4.74	5.25	20	27	
B-10	74-79	6	4.53	4.82	20	27	
B-12 - B-16	80-88	10	5.36	5.78	21	26	
B-22 - B-27	89-92	4	2.82	3.57	21	26	4.74*
B-28	93-94	2	1.51	1.65	11	36	
B-29	95-97	3	1.14	1.36	20	27	
B-30	101	2	.74	.38	5	42	
C-01 - C-03	1-3	3	2.51	2.65	11	36	
C-04	4-6	3	1.72	2.91	21	26	2.86*
C-05 - C-07	7-11	5	3.14	3.74	20	27	1.85
C-08	L-1	5	1.95	.95	2	45	
C-09	L-2	6	1.42	.80	7	40	
D-01	12-13	2	1.74	1.65	5	42	
D-02	14	1	.91	.91	4	43	
D-03	15	1	.95	.95	2	45	
D-04	16-19	4	3.06	3.44	21	26	
D-05	20	1	.89	.89	4	43	

* $p < .05$

TABLE 4 (cont'd.)

Lesson No.	Diag. Test Item or Clusters	No. of Questions	Mean Pretest Score	Mean Posttest Score	No. of Students Increasing Score	No. of Students Decreasing Score or Remaining Same	t Ratio on Selected Pairs
B-06	21-22	2	1.70	1.85	8	39	
B-07	23	1	.65	.70	9	38	
B-08	24-25	2	.97	1.00	11	36	
B-09	26-27	2	1.74	1.70	8	39	
B-10	28-29	2	1.57	1.68	7	40	
B-12	33-35	3	2.21	2.14	6	41	
B-13	36	1	.65	.63	5	42	
B-14	37	1	.63	.65	9	38	

If there appeared to be an appreciable change from pretest to posttest, a t test was performed to see if the change was significant. There were two items where the increase in scores was significant: the items for lesson C-04 and the items for lessons B-22 through B-27.

Lesson C-04 is Arranging Letter-Number-Letter Groups in Alpha-numeric Order. The increase in scores may be accounted for by the fact that students who have probably never been exposed to these letter-number-letter groups used call signs during the course and thereby became familiar with these symbols for the first time.

Lessons B-22 through B-27 are lessons in Comprehending Reading Passages on Topics Related to Radio Teletype Communications. The increase in scores may be attributed to the fact that the students acquired much of the information contained in the questions during the course. They may have been able to answer the questions without reading the passage. The improvement in their scores would, therefore, reflect an increase in knowledge and not an improvement in reading comprehension skill.

Table 5 presents Diagnostic Test scores by the three major skill areas, before starting and after completing 05C AIT training, before the onset of the FBSEP. The results show a significant improvement in basic skills knowledge for the total test as well as for the language and reading subtests. No change is evident for math. Students who graduate acquire or retain the basic knowledge and skills which are prerequisite for learning the technical tasks taught in the 05C AIT Course.

It is interesting to compare the mean score obtained by the course graduates with the highest possible scores. Noting that the test scores reported here are means, it appears that there is room for improvement here.

TABLE 5

SCORES ON THREE COMPONENTS OF DIAGNOSTIC TEST
BEFORE AND AFTER 05C TRAINING FOR 47 STUDENTS
PRIOR TO THE IMPLEMENTATION OF FBSEP

Test Component	Highest Possible Score	Mean Scores Before Training	Mean Scores After Training	t Value
Language Skills	22	14.7	17.9	6.28*
Math Skills	28	21.0	21.7	1.65
Reading Skills	70	49.2	52.8	3.02*
Total	120	84.9	92.5	4.89*

* = Significant at .01 level or better.

Two points should be made before ending this section of the report. First while the data shows that course graduates acquire and retain necessary basic skills without the FBSEP, it is likely that the presence of the FBSEP would facilitate their progress. The FBSEP should make it possible for students to experience less problems and move more rapidly through the 05C AIT Course. Second, we have no comparable acquisition and retention data on students who failed to graduate from the 05C AIT Course. It is likely, however, that their failure was due, at least in part, to their failure to acquire the basic knowledge and skills which are prerequisite for the 05C AIT Course.

8. VERIFICATION OF OBSERVED DIFFICULTIES IN 05C AIT COURSE

Soon after the start of the FBSEP project, members of the research team conducted systematic observations of training and testing in the 05C AIT Course. One of their findings was that some of the knowledge and skills taught in the course were tested inadequately or were not tested at all. One possible effect of this weakness, is that some students may not possess technical knowledge and skills which are prerequisite to other knowledge and skills taught in the course.

In order to verify the hypothesis that students may not have the technical knowledge and skills that they should have, five "interval tests" were prepared. Because of time constraints, only the first three of these tests could be administered to students. The first interval test was administered to 106 students after they had completed Annex H, Radiotelephone Procedures. The second interval test was administered to 47 students who had completed Annex H and the next annex in the training sequence, Annex J, Teletypewriter Communications Procedures. The third interval test was administered to 11 students who had completed Annexes H, J, and the third annex in the training sequence, Annex K, Radio Set AN/GRC-106. It should be noted that all three tests focused on materials taught in the course and which one might expect the students to know as a result of the training they had received.

Tables 6, 7, and 8 on the following pages show an abbreviated form of the test item, the test item format (FI = fill-in, M = matching, MC = multiple choice), and the percent of students answering each test item correctly.

It is reasonable to assume that no more than 20% of the students should incorrectly answer questions on material that they have just been taught. As can be seen in the three tables, the error rate far exceeds the modest 20% standard. On Interval Test #1, the failure rate exceeded 20% on 34 of the 40 scorable items. The corresponding values for Interval Test #2,are 13 out of 33. On Interval Test #3, 12 out of 21 items exceeded the 20% failure rate.

The data in the three tables should be useful to members of the 05C faculty in identifying weaknesses in the current training program. For example, the table for Interval Test #1 reveals that students have far more trouble in finding call signs and suffixes in a CEOI than they have in finding frequencies. This same table also shows that students are able to match selected prowords with their meanings and are able to use an authentication table. On the other hand, the table also shows that between two-thirds and three-fourths of the students did not know how to respond correctly to requests for repetition.

It should be remembered that the interval tests are pencil and paper tests that, in most instances, only roughly approximate how the knowledge or skill is actually used on the job. While it is possible that some students will be able to perform the task though they cannot answer questions about the task, it is more likely that students who cannot answer questions about the task also will not be able to perform the task.

TABLE 6

INTERVAL TEST #1:

TEST ITEM, TEST ITEM FORMAT, AND PERCENT OF STUDENTS ANSWERING TEST ITEM INCORRECTLY

TEST ITEM	TEST ITEM FORMAT	PERCENT OF STUDENTS INCORRECT
1. Use CEOI		
a. Find NCS call sign and suffix	FI	60
b. Find NCS frequency	FI	23
2. Use CEOI		
a. Find Commander's call sign and suffix	FI	52
b. Find frequency	FI	26
3. Use CEOI and DA Form 4004		
a. Find and enter call sign of originator on form	FI	55
b. Find and enter call sign of action addressee on form	FI	55
4. Match proword with meaning		
a. SAY AGAIN	M	22
b. INTERROGATIVE	M	18
c. ALL AFTER	M	9
d. WORD BEFORE	M	6
e. THIS IS	M	3
5. Operator questions "time" in text of message	MC	42
6. Operator requests repetition of missing information in text of message	MC	74
7. NCS transmissions		
a. To open a net	FI	24
b. To close a net	FI	23

TABLE 6 (cont'd.)

TEST ITEM		TEST ITEM FORMAT	PERCENT OF STUDENTS INCORRECT
8.	Authenticate a challenge using an Authentication Table		
	a. #1	FI	4
	b. #2	FI	5
	c. #3	FI	6
9.	Enter Operator's Service on DA Form 4004	FI	31
10.	Definition of Message Number	MC	31
11.	Sequence of elements in a data-time-group	MC	8
12.	Elements in an Operator's Service.	MC	18
13.	Detect problems in messages and requests repetition		
	a. Find error in text of message	MC	41
	b. Request repetition of incorrect word	FI	64
	c. Find omission in text of message	MC	36
	d. Request repetition of omitted word	FI	54
14.	Respond to request for repetition.		
	a. Repeats word sent/received incorrectly	FI	67
	b. Repeats word omitted	FI	76
15.	Operator questions "time" in text of message	FI	68
16.	Fill-out a MIJI Form		
	a. Victim's call sign	M	74
	b. Victim's function	M	59
	c. Type of incident	M	44
	d. Operator's name and function	M	39
	e. Nomenclature of equipment effected	M	39
	f. Frequency or channel affected	M	33

TABLE 6 (cont'd)

TEST ITEM	TEST ITEM FORMAT	PERCENT OF STUDENTS INCORRECT
17. Fill-out DA Form 4004 with aid of a CEOI		
a. Originator's call sign/suffix changed to plain language	FI/M	58
b. Action addressee's call sign/ suffix changed to plain language	FI/M	57
c. Signature of drafter	FI/M	26
d. Grade of drafter	FI/M	25
e. Date-time-group	FI/M	16
18. Make entries on Operator's Number Sheet		
a. For a message received	FI	34
b. For a message sent	FI	26
19. Procedure to correct an error on Operator's Log or Number Sheet	MC	8
20. The time when the operator's signature appears on the Operator's Number Sheet	MC	12
21. The time when a new Operator's Log is started?	MC	37
22. The purpose of the Circuit Log	MC	78

TABLE 7

INTERVAL TEST #2:

TEST ITEM, TEST ITEM FORMAT, AND PERCENT OF STUDENTS ANSWERING TEST ITEM INCORRECTLY

	TEST ITEM	TEST ITEM FORMAT	PERCENT OF STUDENTS INCORRECT
1.	Match prosigns with meaning		
	a. INT	M	0
	b. IMI	M	2
	c. AR	M	0
	d. WA	M	0
	e. DE	M	0
	f. BT	M	0
	g. AB	M	0
	h. K	M	0
2.	Match operating signals with meaning.		
	a. ZBK	M	0
	b. ZUJ	M	0
	c. ZBK1	M	2
	d. ZKJ	M	55
3.	NCS transmission		
	Tune transmitter to zero beat		
	a. DE	FI	17
	b. ZRC2	FI	68
	Question receiving operator, end transmission, ask for a response		
	c. INT	FI	48
	d. ZBK	FI	38
	e. K	FI	29
4.	Definition of a single call	MC	10
5.	Definition of a multiple call	MC	17

TABLE 7 (cont'd.)

	TEST ITEM	TEST ITEM FORMAT	PERCENT OF STUDENTS INCORRECT
6.	Time when a preliminary call is used	MC	21
7.	Prosign used to confirm portion of text	FI	59
8.	Prosign used for a flash message	FI	8
9.	Prosign used for an immediate message	FI	21
10.	Prosign used when in doubt about part of message	FI	23
11.	Example of reference point for "word after."	MC	34
12.	Question group count in message	FI	19
13.	Request repetition of one element in message	MC	89
14.	Request repetition of more than one missing element in address component of message	MC	25
15.	Request repetition of two or more missing elements in heading component of message	MC	0
16.	Request repetition of an encrypted group	MC	17
17.	Request repetition of three or more consecutive encrypted groups	MC	17
18.	Request repetition when fifty percent or more of text is missing.	MC	21
19.	Reference point when missing the ending of message	MC	8

TABLE 8

INTERVAL TEST #3:

TEST ITEM, TEST ITEM FORMAT, AND PERCENT OF STUDENTS ANSWERING TEST ITEM INCORRECTLY

	TEST ITEM	TEST ITEM FORMAT	PERCENT OF STUDENTS INCORRECT
1.	Action taken by operator in RWI system after conversation is completed.	MC	18
2.	Number of batteries used in SB-22/PT switchboard	MC	72
3.	Identification number of batteries used in SB-22/PT switchboard.	MC	18
4.	Locate telephone switchboard designators and telephone numbers in CEOI extract.		
	a. #1	FI	45
	b. #2	FI	54
	c. #3	FI	45
	d. #4	FI	45
5.	Fill-out DA Form 2404 using Table from a TM.		
	a. Nomenclature and model	FI/M	0
	b. Serial number	FI/M	0
	c. Date	FI/M	9
	d. Type of inspection	FI/M	0
	e. TM number	FI/M	45
	f. TM Date	FI/M	0
	g. TM Item number	FI/M	54
	h. Deficiencies and shortcomings	FI/M	0
6.	Setting of VOX switch on AN/GRC-106 radio to transmit	MC	0
7.	Function of frequency vernier on an AN/GRC-106 radio	MC	27
8.	Control on AN/GRC-106 radio to use to reduce noise level.	MC	36

TABLE 8 (cont'd.)

	TEST ITEM	TEST ITEM FORMAT	PERCENT OF STUDENTS INCORRECT
9.	Connection at one end of the RF cable assembly of the AN/GRC-106 radio when used in the receive mode.	MC	36
10.	Connection at one end of the RF cable assembly of the AN/GRC-106 radio when used in the transmit mode.	MC	27
11.	Effect of having bare ends of wire connecting line terminals of the AN/GSA-7 make contact with each other	MC	63

9. RESULTS OF THE VERIFICATION OF BASIC SKILLS

One approach to verifying the basic skills selected as prerequisites for inclusion in FBSEP is to correlate scores on the Diagnostic Test with success in the 05C AIT Course. However, caution should be exercised regarding this approach because the Diagnostic Test is not a perfect instrument for measuring the basic skills identified. Due to the constraints of time allowed for administering the test (2 hours), the test scores should be considered a sample measurement of the basic skills.

Table shows the correlations between the Diagnostic Test and its subsections with student status in the course at the end of Annex J, the annex concerned with sending messages on the teletypewriter. Student status was dichotomized as success or failure. Students who were dropped from the course for academic or other reasons, at the end of Annex J or earlier, were classified as failures. Students who passed the Annex J test, and all earlier tests, were classified as successes. It should be noted that while some students are dropped from the course prior to Annex J, and some in Annex J, few if any drops occur later in the course.

TABLE 9

CORRELATION OF DIAGNOSTIC TEST SCORES WITH SUCCESS IN THE 05C COURSE

	CORRELATION
Diagnostic Test	.12*
Math subsection	.11*
Language subsection	.05
Reading	.09
N=325	*p < .05

While these correlations are low, those for the test as a whole and for the math subsection are significant. If we had assumed an underlying continuous distribution for success in the 05C course instead of a dichotomous distribution, we could have computed biserial correlations which are usually higher than the point biserial correlation used here. In other words, it is postulated that the true correlations are higher than those presented here, and the correlation for reading would be significant (.13).

It also should be noted that the "failure" category includes students who were dropped from the course for <u>administrative</u> reasons. If the data were limited to success and failure on <u>academic</u> performance only, the correlations might well be higher.

Once the 05C FBSEP is implemented data should be collected on the students who go through their assigned basic skills lessons to see if the failure rate in the 05C course is reduced. This will be the final verification of the basic skills.

Procedures for Eliminating Invalid Data

The following precautions were taken to ensure the accuracy of the data collected.

1. Predictor measures

   a. Diagnostic Test total scores and subsection scores were checked visually for values outside the possible score range. Since this data was collected on Form C of the test, the possible ranges for the subtests and total tests are as follows:

		# right
1.	Language	0-22
2.	Math	0-28
3.	Reading	0-70
4.	Total Test	0-120

   b. Student Questionnaire items were checked to see that all items were answered and that only one choice was selected. This check was made by the proctors when the student handed in his Diagnostic Test answer sheet. If there was a problem it could be handled immediately.

c. ASVAB scores were checked to see that all required subtest scores are available. Since no student scoring below 95 in the SC subtest may take the 05C course, all SC scores were checked to see that they were above 95. Also a maximum score of 135 is possible. Therefore, these scores must be within a range of 95-135.

2. Criterion measures - Information obtained from the 05C course summary sheets were checked against the data collected from the instructors. For example, if the summary sheet indicated that a student had two retests, both retests should be available in the form of check-lists for end-of-lesson tests. These test results were compared to the printouts obtained from ATRMS to see if there were differences. If differences occurred they were rectified before being key-punched.

10. ANALYSIS OF BASELINE DATA AND FAILURES

Date was collected on 270 students who failed to complete the 05C AIT course prior to the onset of FBSEP. This section of the Interim Report describes some of the characteristics of these students.

Academic vs Administrative Failures

On the basis of information available to the FBSEP team located at Ft. Gordon, students who failed to complete the 05C AIT course were classified as either an academic failure or an administrative failure. A student was classified as an academic failure if it was judged that the reason for failure was lack of aptitude or lack of prerequisites. A student was classified as an administrative failure if it was judged that the reason for the failure was lack of motivation or personal problems which interfered with academic performance. While it is recognized that often one affects the other and that clear distinctions cannot always be made between the two, the data we have may prove useful to course administrators and faculty. The date is presented in Table 10.

TABLE 10

FREQUENCY AND PERCENT OF STUDENTS WHO WERE DROPPED FROM THE 05C AIT COURSE FOR ACADEMIC AND ADMINISTRATIVE REASONS

	N	%
Academic Drop	192	71
Administrative Drop	54	20
Unknown	24	9
	270	100%

It is apparent that the major reason for being dropped from the course was judged to be academic, the student lacking the aptitude or the prerequisites needed to succeed in the course.

Annex Difficulty

Using available data, the FBSEP team at Ft. Gordon also made a judgment regarding the particular 05C AIT annex in which the students who were dropped from the course, regardless of reason, experienced the most difficulty. Two categories of "difficulty" were established, primary and secondary. Table 11 shows which annexes were judged to be of primary and secondary difficulty for the student.

TABLE 11

FREQUENCY AND PERCENT OF STUDENTS DROPPED FROM THE COURSE HAVING DIFFICULTY WITH ANNEXES G, H, AND J

Annex			
Primary Difficulty	Secondary Difficulty	N	%
G	H & J	4	
G	H	65	
G	J	49	
G	-	60	
Sub total		178	66
H	G	21	
H	J	1	
H	-	20	
Sub total		42	16
J	G & H	1	
J	G	13	
J	J	4	
J	-	31	
Sub total		49	18
Grand total		270	100
G	Primary or secondary	214	49
H	Primary or secondary	116	27
J	Primary or secondary	106	24
		436	100

It is evident from the table that the annex judged to cause the most difficulty was Annex G, typing. Annexes H (Radio Voice Procedures) and J (Radio Teletypewriter Procedures) were judged to be about equally difficult for students. It should be noted that typing also is an important component of Annex J.

Attitudes of Students

Students who were dropped from the course were given 15 cards, each containing a different problem which could affect their performance in the course. The student were directed to select those cards (problems) which best explained their failure in the course. The results are shown in Table 12.

It is apparent that the problem most frequently reported by students was, "I could not learn to type." This finding is consistent with the judgment of FBSEP personnel at Fort Gordon that the annex which caused primary difficulty for students was Annex G, Typing.

TABLE 12

FREQUENCY AND PERCENT OF PROBLEMS REPORTED BY STUDENTS WHO WERE DROPPED FROM THE 05C AIT COURSE

Problem	N	%
I could not learn to type.	163	25
I could not learn the material.	76	12
I want to be reclassified to another MOS.	71	11
I had personal problems at home.	59	9
The recruiter lied/mislead about the MOS.	53	8
I dislike the army.	40	6
I could not understand the instructor.	34	5
I do not like a self paced course.	28	4
I had too much lost time from course.	25	4
Company life: No sleep, barracks life, duty, extra duty, etc.	22	3
I do not like to be in a classroom.	22	3
There were too many distractions in self paced class.	21	3
I have physical defects/health problems.	21	3
I could not get along with the instructor.	19	3
I have religious convictions which will not allow me to participate in the army.	6	1
TOTAL -	660	100

Attrition Rate By Size of Class

The course method of calculating attrition rates has been to divide the percentage of students leaving the course each week without graduating by the total number of graduates plus attriter for that week:

$$\frac{\text{attrites}}{\text{graduates + attrites}} = \text{percentage}$$

This formula has the weakness that it does not have a relationship to the course load or inputs.

We have tracked the attrition rate thoughout our entire contract period and have calculated an attrition rate for each week. This attrition rate is calculated by first matching each student with their input group and then calculating a percentage of each group that has failed the course. This process allows us to see how many students from each group fail the course.

Data on size of class and number of students dropped from each class was collected for 46 classes, starting on 10 July 1981 and ending on 11 June 1982. Figure 5 presents the data in graphic form. The upper line shows the number of students that started training on the given date. Starting class size ranged from twelve on 24 July 1981 to 119 on 18 September 1981. The lower line shows the number of students that were dropped from that class, that is, did not graduate. The number of "drops" ranged

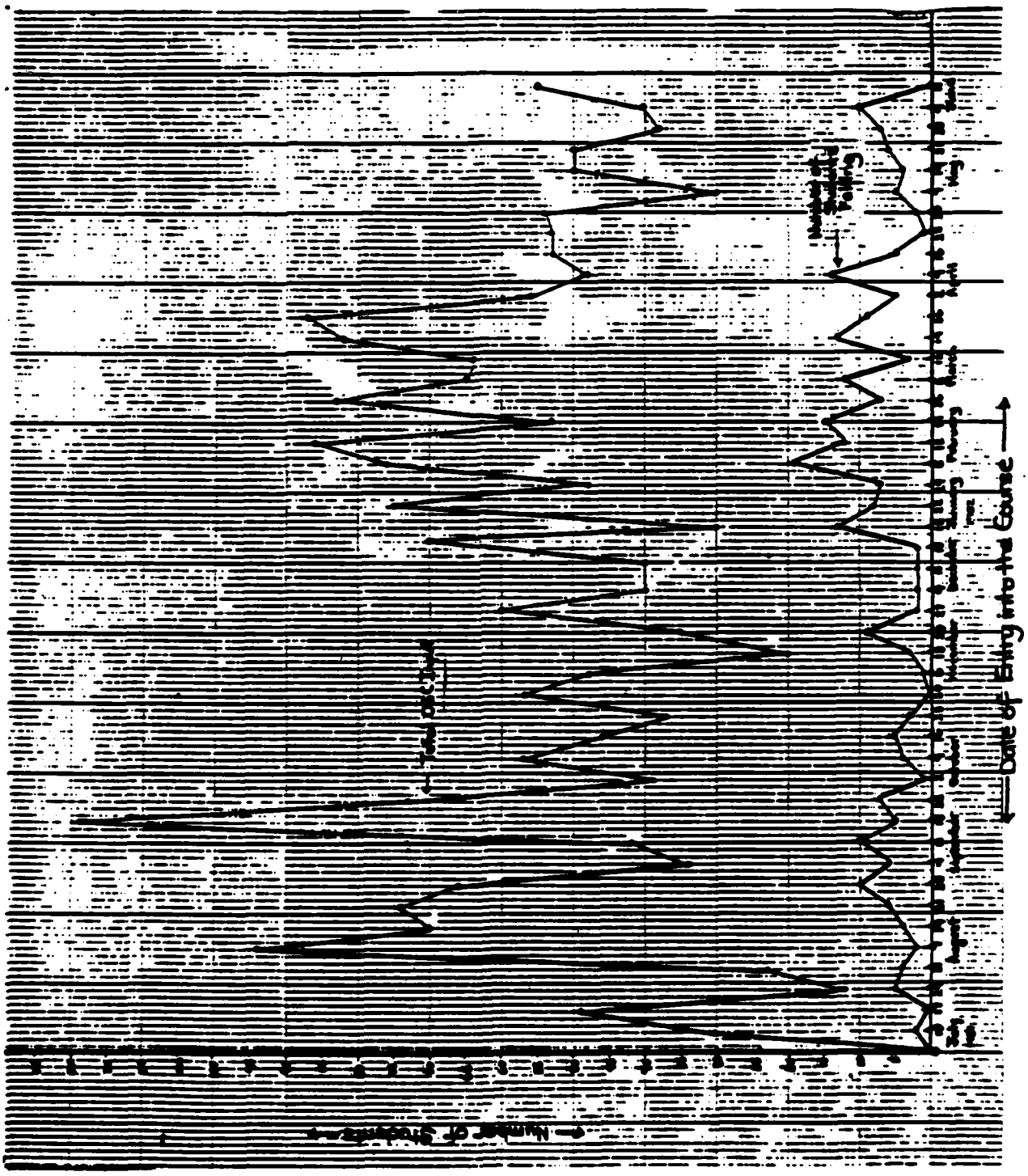


Figure 5. Class size and number of students dropped from that class.

from 0 for the class which started training on 17 July 1981 to 20 for the class which started training on 5 February 1982.

For purposes of analysis, the 46 classes were divided into three groups on the basis of their enrollment at the start of training: 12-45 students, 46-60 students, and 61-119 students. The number of students dropped from the classes in each groups was then determined. (Appendix A relates the attrition rate to the percentage of students dropped for each week.) The data is presented in Table 13.

TABLE 13

MEAN CLASS SIZE, MEAN NUMBER OF STUDENTS DROPPED, AND PERCENT DROPPED FOR 46 05C AIT CLASSES

	Class Size		
	12-45	46-60	61-119
Number of classes	15	16	15
Mean size of each class	32.7	52.2	78.9
Mean number of students dropped	5.5	4.4	7.9
Percent of students dropped	17%	8%	10%

The table shows that while there were more students dropped from the largest classes (61-119 students) than from the smaller classes (12-45 and 46-60 students), the drop rate for the largest classes was about the same as for middle-size classes and lower

than for the smallest classes. It thus appears that increasing the size of the class does not result in an increase in the drop rate. However, in terms of number of students failing out of the course, the number is smaller when the class size is under 60.

11. DIFFICULTIES ENCOUNTERED AND PRINCIPAL FINDINGS

This section of the report presents the difficulties encountered in the research and development effort which culminated in the Analysis Report and dilineates the principal findings of this research and development effort.

Difficulties Encountered

This section describes the difficulties encountered in conducting the research and development effort. Certain difficulties were more evident for the San Diego team than for the Ft. Gordon team, because the San Diego team did not have ready access to the equipment and subject matter experts located at the Signal School. The problems were generally solved by contacting the Signal School team and asking them to examine the equipment and/or consult subject matter experts on the faculty.

1. In the course of examining AIT training materials in order to identify gaps and prerequisite competencies, the analyst should have ready access to the equipment (radios, teletypewriter, antennas, etc.) which is the subject matter of the AIT lessons. Having this equipment at hand would allow the analyst to more quickly recognize gaps in the training materials and identify the basic skills which are prerequisite to the AIT lesson.

2. Related to this was the unavailability of certain Learning Supervisor Guides and Technical Manuals, and restricted access to classified training areas. These limitations complicated the task of developing present and recommended heirarchical structures for each lesson.

3. The lack of consistency between different training resources (lesson study guides, training circulars, CEOI, and TEC) also severely compounded the difficulties encountered in developing both the present and recommended heirarchical structures for each lesson.

4. Still other factors compounding the analysis procedure were ambiguities and gaps in available training materials and the fact that some of the materials made available to the analysts was obsolete and had already been superseded by more current or revised materials. As noted earlier, these problems were overcome, but their presence hampered the analysis process.

5. When analyzing training materials and preparing present and recommend heirarchical structures for each AIT lesson, analysts attempted to classify the behavior that the student was expected to learn into the following nine categories:

Know fact

Know concept
Use concept

Know procedure
Use procedure

Know rule
Use rule

Know principle
Use principle

Despite definitions and examples of each category, it frequently proved difficult to make definitive categorizations. Particular difficulty was encountered in distinguishing between "know fact," "know concept," and "know rule." It should be remembered that these categories are not present in the existing study material and that it was the analyst who tried to superimpose them on the existing structure and incorporate them to the recommended structure. While categorizations were made, we have reservations about the validity and reliability of the results. We doubt that these weaknesses will have any affect on the final outcome of the research and development effort.

6. Another problem encountered in developing heirarchical structures for the AIT lessons was noting behaviors that had been presented in earlier lessons. As has been described earlier, such behaviors were annotated as being "remember" items. This constituted a problem because turnover among analysts and the assignment of different analysts to

different lessons resulted in lack of continuity. If the analyst had not examined the earlier lesson in which the behavior had first been taught, he had no reason to cite its subsequent appearance in a later lesson as a "remember" item.

7. In analyzing training materials in order to develop heirarchical structures, and identify gaps in technical content and prerequisite competencies, the analysts examined the Soldier's Manual, the Lesson Study Guides, the Learning Supervisor's Guides, and the mandatory elements in the end of course test. Ideally, there should be a consistency between the content in all these documents. Unfortunately this was not always true. Because of content discrepancies in the documents, the analyst relied most heavily on the Lesson Study Guides and Learning Supervisor's Guides in making their analysis. This was done because these two documents most completely describe what the Army has decided the student should be taught in the 05C AIT Course, the focus of our attention in the FBSEP.

Both the Lesson Study Guide and Learning Supervisor's Guide for each lesson list the identification number of Soldier's Manual tasks which are related to the tasks covered in the lesson. While there should be close agreement in the Soldier's Manual tasks so cited, this is not always the case.

As can be seen in Table 14, in only 31% of the entries is there complete agreement between the Soldier's Manual tasks cited in Lesson Guides and Soldier's Manuals tasks cited in the Learning Supervisor's Guides for the same lesson. Detailed information is found in Appendix B.

TABLE 14

FREQUENCY AND PERCENT OF SOLDIER'S MANUAL TASKS CITED IN LESSON STUDY GUIDES AND LEARNING SUPERVISOR'S GUIDES

	N	%
Same task cited in both Lesson Study Guide and Learning Supervisor's Guide.	37	31
Task cited in Lesson Study Guide only.	44	36
Task cited Learning Supervisor's Guide only.	31	26
Task cited in Lesson Study Guide. No Learning Supervisor's Guide available.	8	7
TOTAL	120	100

Table 15 shows that a number of Soldier's Manual Tasks are not cited in either a Lesson Study Guide nor a Learning Supervisor's Guide as being "related" to an 05C AIT course lesson. Two of the tasks listed actually are taught in the 05C AIT Course, Prepare An Interference Report is taught in lesson H-06 and Install and Operate Communication Equipment TSEC/KY-38 is taught in lesson N-03. Presumably the other tasks are to be learned on-the-job.

TABLE 15

SOLDIER'S MANUAL TASKS NOT LISTED IN LESSON STUDY GUIDES OR LEARNING SUPERVISOR GUIDES FOR THE 05C AIT COURSE

SKILL LEVEL 1

TASK NUMBER	TASK TITLE
113-573-4001	Encode and Decode Messages Using KTC 600D Tactical Operations Code
113-573-7001	Prepare an Interference (MIJI) Report
113-573-8005	Use an Automated CEOI
113-587-2002	Operate Radio Set AN/VRC-64
113-587-2004	Troubleshoot AN/VRC-46 (AN/VRC-12 Series)
113-587-3001	Perform Operator's Preventive Maintenance on Radio Set AN/PRC-77 or AN/PRC-25
113-599-3001	(RC) Perform Weekly Preventive Maintenance on Radio Teletypewriter Set AN/GRC-46
113-609-1003	Install and Operate Communications Equipment TSEC/KY-38
113-609-2013	Operate TSEC/KY-57 in Cipher Test Mode
113-620-1003	Install Radio Set AN/FRC-93
113-620-2005	Operate Radio Set AN/FRC-93
113-620-1004	(SF) Install Radio Set AN/PRC-74B
113-620-2006	(SF) Operate Radio Set AN/PRC-74B
113-622-2001	Operate Radio Set Control Group AN/GRA-6

Five tasks are cited in either Lesson Study Guides, Learning Supervisor's Guides or both but are not listed in the Soldier's Manual for MOS 05C. These tasks are listed in Table 16.

TABLE 16

TASKS LISTED IN LESSON STUDY GUIDES AND/OR LEARNING SUPERVISOR'S GUIDES BUT NOT LISTED IN THE SOLDIER'S MANUAL FOR MOS 05C10

Task Number	Number of Lessons In Which Listed
113-571-1005	1
113-573-8001	8
113-573-6002	1
113-623-3002	1
120-030-1503	2

Table 17 shows which lessons in the course POI and which tasks in the Soldier's Manual are in direct support of each of the 10 "mandatory elements" on the end-of-course-test. To some extent, the "mandatory elements" rather than the Lesson Study Guides or Learning Supervisor's Guides determines the emphasis, if not the content, of instruction in the course.

It should be noted that the two lessons in Annex K support an "optional" but no "mandatory elements" on the end of course test.

TABLE 17

THE TEN MANDATORY ELEMENTS IN TACTICAL EVALUATION OF THE 05C AIT COURSE AND THE LESSONS IN COURSE POI AND TASKS IN SOLDIER'S MANUAL WHICH SUPPORT THEM

1. Touch type on teletypewriter keyboard at 25 net WPM in message format.		
Course POI	G-01	Keyboard Techniques
Soldier's Manual		
4. Maintain Station Log.		
Course POI	H-04	Maintaining Circuit Log and Operator's Number Sheet
Soldier's Manual		
5. Employ radio teletypewriter procedures.		
Course POI	J-01	Establishing Radio Teletypewriter Communications
	J-02	Preparing Teletypewriter Messages
	J-03	Transmitting Requests and Responses
Soldier's Manual	113-573-1002	Prepare a Message For Transmission in 16-Line Format
7. Employ radio telephone procedures.		
Course POI	H-01	Opening And Closing A Radio Telephone Net Using Radio Set AN/PRC-77
	H-02	Preparing Radio Telephone Messages for Transmission
	H-03	Transmitting Messages in a Radio Telephone Net
Soldier's Manual	113-571-1003	Establish, Enter or Leave A Radio Net
	113-571-1001	Transmit or Receive A Radio Message

TABLE 17 (cont'd.)

8.	Employ electronic counter countermeasures (ECCM)		
	Course POI	H-06	Using Electronic Counter-Counter Measures (ECCM) on FM Radio Equipment
	Soldier's Manual	113-573-6001	Recognize Electronic Countermeasures (ECM) and Implement Electronic Counter-Countermeasures (ECCM)
10.	Install speech security equipment TSEC/KY-8		
	Course POI	L-03	Installing Speech Security Equipment
	Soldier's Manual	113-609-1001	Install and Operate Communication Security Equipment TSEC/KY-8
14.	Install and operate radio teletypewriter set AN/GRC-142-122		
	Course POI	M-02	Install and operate radio teletype-writer set AN/GRC-142 or 122
	Soldier's Manual	113-599-1002	Install Radio Teletype-writer Set AN/GRC-142 or 122
		113-599-2002	Operate Radio Teletype-writer Set AN/GRC-142 or 122
18.	Install and operate RWI system		
	Course POI	I-01	Installing and Operating Radio Wire Integration System
	Soldier's Manual	113-618-1001	Install Radio Wire Integration (RWI) System
		113-618-2001	Operate Radio Wire Integration (RWI) System

TABLE 17 (cont'd.)

20. Install antenna AN/GRA-50		
Course POI	N-03	Installing Antenna Group AN/GRA-50
Soldier's Manual	*113-596-7001	Inspect Contruction Of A Doublet Antenna
22. Install, operate, perform operator's maintenance and troubleshoot generator 10KW 120V ac.		
Course POI	N-05	Installing and Operating Generator Set 10KW 120V ac
	N-06	Preventive Maintenance and Troubleshooting Generator Set 10KW 120V ac.
Soldier's Manual	113-601-1002	Install Generator Set 10KW
	113-601-2003	Operate Generator Set 10KW
	113-601-3002	Perform Daily Preventive Maintenance Checks and Services on Generator Set 10KW
	113-201-2004	Perform Operator's Troubleshooting Procedures on Generator Set 10KW

*Listed in the Soldier's Manual as Skill Level 2.

8. Ideally the Soldier's Manual specifies the tasks in which a person of a particular MOS and skill level must be proficient and the AIT course prepares the student to perform the tasks using the training objective as specified in the Soldier's Manual as the guide for course instruction. The relation between the Soldier's Manual and course lessons for MOS 05C is not that clear. The following example illustrates this point.

Soldier's Manual Task 113-571-1001 is titled Transmit or Receive A Radio Message. The following 05C AIT course lessons cite the above Soldier's Manual task as being related:

F-02 Using Alphanumerics

H-02 Preparing Radio Telephone Messages For Transmission

H-03 Transmitting Messages in a Radiotelephone Net

H-04 Maintaining Circuit Log and Operator's Number Sheet

H-05 Install and Operate Radio Set AN/VRC-12 Series

I-01 Installing and Operating Radio Wire Integration System

J-03 Transmitting Requests and Responses

K-01 Installing and Operating Radio Set AN/GRC-106

The term "related" is not defined and in most instances, the relation between the task in the Soldier's Manual and the lessons in the course is tenuous. Lessons F-02 and H-02 are clearly related to the Soldier's Manual task, both in the content of the instruction and in the practice exercises which follow the lesson. Lessons H-03 and J-03 are concerned with requests for repetition and responding to requests for repetition, two tasks which are hardly noted in the Soldier's Manual Task and which constitute very narrow and specialized aspects of transmitting and receiving messages. Lessons H-05, I-01 and K-01 require the student to transmit and receive a message as part of the practice exercise which follows the lesson, but we suspect that transmitting and receiving messages in these three lessons is minimal, and incidental to installing and operating the equipment. Lesson H-04 includes no requirement to transmit or receive a message.

The discrepency between Soldier's Manual tasks and 05C AIT course lessons is also evident when one examines the components of both the Soldier's Manual task and the 05C AIT course lessons specifically concerned with transmitting and receiving messages (F-02 and H-02).

An examination of the performance measures listed under the Soldier's Manual task reveals that this task encompasses five elements:

1. transmitting prowords
2. transmitting isolated letters and abbreviations using the phonetic alphabet
3. phonetically spelling unusual or difficult words
4. transmitting numerals phonetically (digit by digit)
5. transmitting numbers that are exact multiples of thousands (not digit by digit)

Following a discussion of the five above elements, the Soldier's Manual task presents a sample transmission incorporating these elements.

The following discrepencies occur between the specifications in the Soldier's Manual and the specifications in course lessons F-02 and H-02.

1. Neither course lesson makes any reference to the transmission of numerals other than digit by digit.
2. The sample transmission in the Soldier's Manual omits many elements found in the sample message included in 05C AIT lesson H-02. Among these omissions are:
   a. First part of preliminary call of receiving station
   b. First part of message heading
   c. Message number

d. Priority

e. Date-time-group

f. From, To, Info, Exempt (Location in message)

g. Break (Location in message)

h. First part of receiving station's acknowledgement

3. The sample transmission in the Soldier's Manual uses abbreviated call signs to identify both the transmitting and receiving stations. Abbreviated call signs are mentioned only briefly and are not used at all in the sample messages included in lesson H-02.

4. The sample transmission in the Soldier's Manual uses the phonetic alphabet to show abbreviations and uses words to indicate punctuation in the message. Neither of these items are mentioned in lessons F-02 or H-02

The reader may well wonder why we have presented so detailed a discussion of discrepencies between tasks in the Soldier's Manual and lessons in the 05C AIT course. The reason is that these are the documents that the analyst must use to prepare his heirarchical analysis, to identify gaps in course content and to identify prerequisite competencies. If the analyst expects to find a well organized and clearly defined set of training objectives, he may be sadly disappointed. He will often find discrepencies and inconsistencies which he will have to resolve before he can proceed with his main task.

9. After examining the training materials for a lesson, the analyst prepared two structures, a Present Structure which showed the current arrangement (sequence) of lesson components and a Recommended Structure which showed the proposed arrangement (sequence) of lesson components. As noted earlier, the components in the Recommended Structure were not necessarily identical with those in the Present Structure. This was true when the analyst felt that certain components should be added or deleted.

Each structure was presented in two forms, pictorially in the form of a block diagram and textually in the form of an outline. Two problems develped with reference to the pictorial and textual presentation of the structures.

First, while the block diagrams represent learning heirarchies, they are not complete. Strictly speaking, a "learning heirarchy" depicts all the prerequisite relationships of knowledges, skills, and tasks. For example, the name of a task is shown within a box. The names of the one or more tasks which are directly prerequisite to the first task are shown in boxes below the first task. In turn, the names of the one or more tasks which are directly prerequisite to each second level task are shown in boxes directly below the task to which they apply. This pattern

continues until the objective has been broken down to it's most basic subordinate objectives. As examination of the block diagrams reveals, they generally do not show this specificity. They show the terminal learning objective and only two or three lower levels of enabling objectives.

The second problem is with the textual description of the lesson's structure. It must be understood that this too is presented in hierarchial form with the major objective at the top or stated first and the lower level enabling objectives following. The presentation, therefore, is in the reverse order of the instructional and learning processes and should be applied in a "botton-up" sequence within each section.

10. A major focus of the analyst was to identify gaps in the content of the lesson material that would serve as a barrier to learning. Gaps were identified by carefully examining the sequence of content in each lesson.

Three types of gaps were identified in the lesson material. First, there were gaps in the explanation of key terms and concepts; that is, a term or concept is used but, in the judgment of the analyst, inadequately defined, explained,

or described in the training material. Often, the terms referred to components of the equipment that the student was being taught to install or operate.

A second type of gap took the form of an ambiguity in the steps to be followed in a procedure. The analyst read the steps in the Lesson Study Guide and tried to mentally perform each step in the procedure. When he encountered a point in the text where the explanation was confusing or not as clear as it could be, it was noted. This too was a matter of judgment on the anlyst's part. In some cases, the analyst was able to clarify the ambiguity from the context of the material. In other cases, it was necessary to examine technical manuals or consult instructors to clarify the material. Generally, these gaps were filled by inserting a word or two, replacing a pronoun with a noun, repeating a phrase, clause or sentence, or rearranging parts of a sentence.

The third type of gap, occuring far less often than the other two, was the omission of a fairly complex procedure needed in order to attain the lesson's terminal objective. Three gaps of this type were noted in the training material. The first concerned the CEOI. Though on the job the soldier will be required to use the CEOI to determine call sign,

suffixes, and frequencies, he is not required to do this in the 05C AIT course. When the task requires the student to use a call sign, suffix, or frequency, he is given this information in the form of an "extract from a CEOI." We have decided that it is doing a disservice to the student and to his future unit to leave this gap unfilled. Accordingly, we have inserted instruction on finding information in the CEOI in the recommended structure for lesson H-01 and included instruction on finding information in tables as one of the basic skills for the FBSEP.

The second complex procedure omitted from the training material concerns the identification of information that is missing or in error. In the 05C course the student is taught how to request repetition of missing or erroneous information and how to respond to requests for repetition. When the student performs this task, he is told what information is missing or erroneous. He is given no instruction or practice on deciding for himself whether or not information is missing or erroneous. We felt that this gap too should be filled. Accordingly we have included instruction on deciding if information is missing or erroneous among the basic skills to be covered in the FBSEP.

The third complex procedure omitted from the training material concerns erecting the doublet antenna when not using the

tripod adapter. The student is taught how to prepare the antenna for erection but not how to actually erect it. Since, on the job, the student would be expected to erect the antenna, we have recommended that instruction on erecting the antenna be included in lesson N-02. We also have given suggestions on how this might be done dispite limited resources.

Principal Findings

This section summarizes the principal findings of the research and development effort up through the preparation of the Analysis Report. The findings are of two types, those concerned with the research and development procedure and those concerned with the data that is the product of that procedure. The following are the principal procedural findings.

1. Despite the procedural problems cited earlier, training analysts, using recognized analytic procedures, can examine training resources and, although not expert in the technical aspects of the content, develop heirarchical structures for technical lessons.

2. Training analysts can identify gaps in the technical content of each lesson, identify basic skills which constitute pre-requisite competencies for each lesson, identify poor sequencing of lesson content, and identify technical content which should be deferred or deleted from each lesson.

The data findings are shown below.

3. The frequency with which the four types of problems cited in #2 above occurred in the 25 05C AIT lessons is shown in the following table.

TABLE 18

NUMBER OF 05C AIT LESSONS IN WHICH
CONTENT PROBLEMS WERE FOUND

Type of Problem	Number of Lessons
Technical content missing	25
Basic skills required	25
Technical content in poor sequence	13
Unnecessary technical content	11

In the judgment of the anlysts, there were gaps in technical content and a requirement for training in basic skills in every lesson. The specific types of missing technical content and their frequency of occurrence are shown below.

TABLE 19

FREQUENCY OF MISSING TECHNICAL CONTENT
IN 05C AIT LESSONS

Type Of Technical Content	Frequency
concepts	157
facts	98
steps in a procedure	50
rules	20
principles	1

It should be noted that the number 157 does not represent 157 unique concepts because at times, the same concept was reported missing in more than one lesson. The other frequencies represent unique entries.

The specific types of required basic skills and their frequency are shown in the following table.

TABLE 20

FREQUENCY OF REQUIRED BASIC SKILLS
IN 05C AIT LESSONS

Type Of Basic Skill	Frequency
Concepts	119
Procedures	91

The frequencies shown do not represent unique entries because the same concept or procedure was often reported relevant in more than one lesson.

4. In the opinion of the analysts, the training materials (lesson study guides and learning supervisors guides) are of eneven quality and often lack the clarity, specificity, and format required for a self-instruction program. To some extent, these weaknesses are overcome by instructors who clarify misunderstanding and fill gaps in the training

materials. But to the extent that instructor intervention is required, the 05C course is not truly a self-instruction course.

5. First hand observation of the conduct of the 05C course reveals that instructors frequently deviate from the format specified in the learning supervisor's guides. These deviations take the form of failing to cover content included in the Guides and, covering content not included in the Guides. Compounding the problem is the fact that instructors teaching the same lesson did not always handle the lesson in the same manner.

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APPENDIX A

05C ATTRITION RATES RELATED TO COURSE INPUTS

05C ATTRITION RATES

	START DATE	NO. OF INPUTS	% DROPPED		START DATE	NO. OF INPUTS	% DROPPED
1981:	July 10	30	6.67	1982:	Jan. 15	30	43.33
	17	49	0		22	75	10.67
	24	12	41.67		29	48	14.58
	31	4	16.67		Feb. 5	75	25.00
	Aug. 7	94	2.13		12	86	13.95
	14	70	5.71		19	53	28.30
	21	74	8.11		26	83	8.33
	28	66	15.15		Mar. 5	65	18.46
	Sept. 4	34	17.65		12	64	4.69
	11	42	23.81		19	82	15.85
	18	119	4.20		26	87	10.34
	25	74	9.59		Apr. 2	56	11.20
	Oct. 2	39	2.56		9	48	29.17
	9	58	7.02		16	53	9.43
	16	46	10.87		23	53	1.89
	23	38	8.11		30	54	3.70
	30	57	0		May 7	30	16.67
	Nov. 6	48	2.08		14	50	8.00
	13	20	15.00		21	50	12.00
	20	35	25.71		28	38	18.42
	27	60	3.33		June 4	40	25.00
	Dec. 4	40	5.00		11	55	0
	11	40	5.00				
	18	70	2.86				

APPENDIX B
SOLDIER'S MANUAL TASKS CITED IN 05C COURSE MATERIALS

Soldier's Manual Tasks Cited in Materials Used By Instructors (I) Students (S) or Both (B) by Lesson.

SKILL LEVEL 1

05C LESSON

TASK NUMBER	TASK TITLE	F	G	H						I	J			K		L			M			N					
		2	1	1	2	3	4	5	6	1	1	2	3	1	2	1	2	3	1	2	3	1	2	3	4	5	6
113-571-1001	Transmit or Receive a Radio Message	B			B	B	I	I		I			S	S													
113-571-1003	Establish, Enter or Leave a Radio Net	B		S	I	I	I	B		I	S			S						S	I						
113-573-1002	Prepare a Message for Transmission in 16-Line Format		I		B							S															
113-573-4001	Encode and Decode Messages Using KTC-600D Tactical Operations Code																										
113-573-4002	Use KAL-61B with KTC-1400 Numerical Code to Authenticate Transmission and Encrypt/Decrypt Numbers and Grid Zone Letters				I	I		B																			
113-573-6001	Recognize Electronic Countermeasures (ECM) and Implement Electronic Counter-Countermeasures (ECCM)								S															S			
113-573-7001	Prepare an Interference (MIJI) Report																										
113-573-8005	Use an Automated CEOI																										
113-587-1001	Install Radio Set AN/PRC-77 or AN/PRC-25			S		I																					
113-587-1002	Install Radio Set AN/VRC-12							B		I																	
113-587-1003	Install Radio Set AN/VRC-64									I																	

TASK NUMBER	TASK TITLE	F	G	H	I	J	K	L	M	N
		2	1	1 2 3 4 5 6	1	1 2 3	1 2	1 2 3	1 2 3	1 2 3 4 5 6
113-587-1004	Install Radio Set AN/VRC-46 (AN/VRC-12 Series)			I						B
113-587-1005	Install Radio Set AN/VRC-49			I						B
113-587-2001	Operate Radio Set AN/PRC-77 or AN/PRC-25	B		S I B I						
113-587-2002	Operate Radio Set AN/VRC-64									
113-587-2003	Operate Radio Set AN/VRC-46 (AN/VRC-12 Series)	B		I B B	I					
113-587-2004	Troubleshoot AN/VRC-46 (AN/VRC-12 Series)									
113-587-3001	Perform Operator's Preventive Maintenance on Radio Set AN/PRC-77 or AN/PRC-25									
113-598-1023	Install Terminal Communications AN/UGC-74A(V) 3									
113-598-2010	Operate Terminal Communications AN/UGC-74A(V)3									
113-598-2024	Perform Operator's Preventive Maintenance Checks and Services on Terminal Communications AN/UGC-74A(V)3									
113-599-1001	(RC) Install Radio Teletypewriter Set AN/GRC-46							?		B B
113-599-1002	Install Radio Teletypewriter Set AN/GRC-142(*) or AN/GRC-122(*)							?	I	B B
113-599-1003	Install Radio Teletypewriter Set AN/VSC-2							?	S	B B

(?= Cited in student material. Instructor material not available.)

TASK NUMBER	TASK TITLE	F	G	H	I	J	K	L	M	N
		2	1	1 2 3 4 5 6	1	1 2 3	1 2	1 2 3	1 2 3	1 2 3 4 5 6
113-599-1004	(RC) Install Radio Set AN/GRC-26D							?		B S
113-599-2001	(RC) Operate Radio Teletypewriter Set AN/GRC-46		I	S				?		
113-599-2002	Operate Radio Teletypewriter Set AN/GRC-142(*) or AN/GRC-122(*)		B	S				?	B	I
113-599-2003	Troubleshoot Radio Teletypewriter Set AN/GRC-142(*) or AN/GRC-122(*)								B	
113-599-2004	Operate Radio Teletypewriter Set AN/VSC-2		B	S				?	B	
113-599-2005	(RC) Operate Radio Set AN/GRC-26D		I	S				?		I
113-599-3001	(RC) Perform Weekly Preventive Maintenance on Radio Teletypewriter Set AN/GRC-46									
113-601-1001	Install Generator Set 5KW	B								S
113-601-1002	Install Generator Set 10KW									S S
113-601-1003	(RC) Install Generator Set 3KW, 28 V DC									S
113-601-2001	Operate Generator Set 5KW									S
113-601-2002	Perform Operator's Troubleshooting Procedures on Generator Set 5KW									B
113-601-2003	Operate Generator Set 10KW									S S
113-601-2004	Perform Operator's Troubleshooting Procedures on Generator Set 10KW									B

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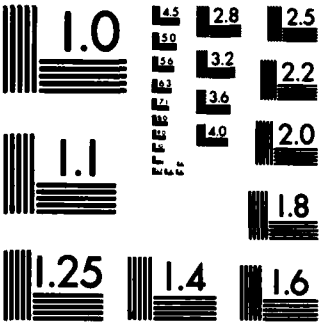
COMMUNICATIONS INC SAN DIEGO CA 18 JUN 82
UNCLASSIFIED DABT60-81-C-0027 F/G 5/9 NL



TASK NUMBER	TASK TITLE	F	G	H							I	J			K		L			M			N					
		7	1	1	2	3	4	5	6		1	1	2	3	1	2	1	2	3	1	2	3	1	2	3	4	5	6
113-601-2005	(RC) Operate Generator Set 3KW, 28 V DC																									S		
113-601-3001	Perform Daily Preventive Maintenance Checks and Services on Generator Set 5KW																											S
113-601-3002	Perform Daily Preventive Maintenance Checks and Services on Generator Set 10KW																											S
113-609-1001	Install and Operate Communications Security Equipment TSEC/KY-8														S		S											
113-609-1002	Install and Operate Speech Security Equipment TSEC/KY-38																S											
113-609-1003	Install and Operate Communications Security Equipment NYL-3/TSEC																											
113-609-2013	Operate TSEC/KY-57 in Cipher Test Mode																											
113-618-1001	Install Radio Wire Integration (RWI) System										S															S		
113-618-2001	Operate Radio Wire Integration (RWI) System	S			I		I	I			S																	
113-620-1001	Install Radio Set AN/GRC-106(*)														S											S		
113-620-1003	Install Radio Set AN/PRC-93																											
113-620-1004	(SF) Install Radio Set AN/PRC-74B																											

TASK NUMBER	TASK TITLE	F	G	H						I	J		K		L			M			N					
		2	1	1	2	3	4	5	6	1	1	2	3	1	2	1	2	3	1	2	3	1	2	3	4	5	6
113-620-2001	Operate Radio Set AN/GRC-106(*)	S			S									S									I				
113-620-2002	Perform Operator Trouble-shooting Procedures on Radio Set AN/GRC-106(*)													S													
113-620-2005	Operate Radio Set AN/PRC-93																										
113-620-2006	(SF) Operate Radio Set AN/PRC-748																										
113-620-3001	Perform Dialy Preventive Maintenance Checks and Services on Radio Set AN/GRC-106(*)													S									S				
113-622-1001	Install Radio Set Control Group AN/GRA-6													S						S							
113-622-1002	Install Radio Set Control Group AN/GRA-39				S					I				S													
113-622-2001	Operate Radio Set Control Group AN/GRA-6																										
113-622-2002	Operate Radio Set Control Group AN/GRA-39				S					I																	
113-623-3001	Prepare DA Form 2404 (Equipment Inspection and Maintenance Worksheet) as a Daily and Weekly Maintenance Report													S													S

SKILL LEVEL 2

05C LESSON

TASK NUMBER	TASK TITLE	F	G	H						I	J		K	L			M	N					
		2	1	1	2	3	4	5	6	1	1	2	3	1	2	1	2	3	1	2	3	1	2	3	4	5	6
113-571-7001	Perform Station/Net Duties															S						S	S				
113-571-7002	Inspect Station/Net Operations																										
113-574-1004	Operate in Radio Nets																										
113-587-7001	Inspect Installed Operational Radio Sets																										
113-596-7001	Inspect Construction of a Doublet Antenna																										
113-601-7001	Inspect Installed Operational Generator Sets																										
113-611-1001	Select Team Radio Site																										
113-618-7001	Inspect Installed Operational Radio Wire Integration System																										
113-622-7001	Inspect Installed Operational Radio Set Control Groups																										
113-623-7002	Inspect Performance of Preventive Maintenance at Team Level																										

END

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