Research Note 85-44

Job Skills Education Program: Review of the Job Task Analysis and Clustering Schema

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Beatrice J. Farr, contracting officer's representative. This report, together with RNs 85-22, 85-37, 85-40, 85-41, 85-42, 85-43, 85-45, 85-46, and 85-47, forms part of a series on the Army's Job Skills Education Program (JSEP).

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The Job Skills Education Program (JSEP) is designed to provide soldiers with the prerequisite knowledge and skills required for successfully learning their Military Occupational Specialties (MOS). When the JSEP is put into effect, it will replace the Army's current Basic Skills Education Program (BSEP) with a sophisticated, computer-based system.

This report presents a review of the RCA contract products to be used in JSEP. All contract products were reviewed and an analysis of their (Continued)

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usefulness to the JSEP curriculum was made. Alternative clustering schemes were tried, but none proved useful for curriculum design. Other RCA contract products, including task analyses, taxonomy, and indicator statements were found useful for JSEP design purposes.

FOREWORD

The Job Skills Education Program (JSEP) is a multi-phase program begun in Fiscal Year 1982, and designed to enhance enlisted career potential by improving soldier job performance. The sponsor, the Education Division, Office of the Deputy Chief of Staff for Personnel, expects JSEP to replace the Army's current Basic Skills Education Program when it is implemented.

The JSEP program, being developed by Florida State University (FSU) will result in a standardized curriculum for soldiers who demonstrate deficiencies in the knowledge and skills required to successfully learn their Military Occupational Specialty (MOS).

In accordance with current policy, JSEP will be an on-duty program. It will also use a computer-based management system to facilitate an open entry/open exit approach. At present, most of the lessons being developed will be computer delivered; however, the plan calls for using existing materials, and incorporating materials developed as part of other ARI efforts, whenever appropriate.

A unique aspect of JSEP is that it builds upon a very detailed front-end analysis of MOS Baseline Skills. The analysis covered tasks performed by soldiers in the 94 highest density MOSs, in addition to Common Tasks (the skills that all soldiers, regardless of their MOS, need to know). Although the Army has over 300 MOSs, the 94 covered in the analysis represent about 80% of all soldiers. Perhaps the most useful product developed for the analysis was a taxonomy listing more than 200 prerequisite competencies.(P.C.) for these MOSs. The competencies were derived from detailed reviews of Soldier Manuals, and from extensive interviews with subject-matter experts at Army schools. This effort produced a series of tests intended to diagnose deficiencies in the P.C.s. Modified versions of these tests will be used in JSEP.

The JSEP program will include a front-end learning strategies module designed to improve soldier skills in reading, studying, test taking, and problem solving. The curriculum will consist of this strategies-training, plus 180 diagnostic review lessons, and 120 skill development lessons, which are being developed for the PLATO and MicroTICCIT computer systems. The program is being tried out at two TRADOC sites and two FORSCOM sites, prior to an Army-wide phased implementation.

REVIEW OF THE JOB TASK ANALYSIS AND CLUSTERING SCHEMA

EXECUTIVE SUMMARY

Requirement:

The solicitation required:

> A review of the job task analysis and clustering schema developed by RCA to determine their suitability for FBSEP II. Subject to agreement by Contracting Officer's Representative (COR), contractor has the option of adopting or modifying the MOS Clustering Schema.
>
> The product of Task 3 will be a viable plan for clustering MOS baseline skills.

Procedure:

The Florida State University (FSU) conducted a thorough and detailed review of the RCA Educational Services (RCA) job task analysis. Except for minor changes, we found the work by RCA to be useful and helpful; consequently, we accepted and incorporated the results of the job analysis and resultant taxonomy into the lesson design.

Also analyzed were the two clustering approaches suggested by RCA. These approaches were (1) clustering by Military Occupational Speciality (MOS) as called for in the solicitation, and (2) clustering by prerequisite competency (PC). To make an informed and rational choice, we studied RCA's clustering report and curriculum model, and then tried several alternative clustering methods.

Our analysis of RCA's proposed curriculum model focused on two main points:

- o The Army's use of the model for implementation and management of the curriculum
- o FSU's use in lesson development

Findings:

We found the US Army Training and Doctrine Command (TRADOC) sponsored MOS Baseline Skills Analysis conducted by RCA to be a thorough and useful analysis of the tasks performed by level 1 and 2 soldiers in the selected 94 MOS.

We agree with RCA's conclusions that clustering does not provide guidance for computer based curriculum development. Based on our understanding of the requirement, our analysis of the RCA reports, and our own clustering efforts, we have found no evidence of underlying commonalities in the raw data.

RCA presented a complete, sequenced, and interdependent curriculum model. Our analysis of the data presented in the reports available to us, however, has not revealed any underlying empirical support for that model.

Utilization of Findings:

The review of RCA's job task analysis facilitated our design effort. The specific products used were:

- o Complete Extended Task Analysis Procedure Results (for each MOS)
- o Prerequisite Competencies (PCs) Indicator Statements (for each MOS)
- o Complete Prerequiste Competency Indicator Statement (for each PC).
- o MOS-PC Matrix (see Appendix A)

Based on our analysis of all RCA contract products and our understanding of the Army requirement, we have recommended that the clustering approach be abandoned in favor of a JSEP soldier management model that accommodates individual soldiers. This model uses test scores to establish a soldier's curriculum, then sequences the instruction based on soldier progress and performance on the lessons. This approach appears to be totally consistent with the capabilities of JSEP and the general requirements in the Statement of Work.

REVIEW OF THE JOB TASK ANALYSIS AND CLUSTERING SCHEMA

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OVERVIEW

Operational Problem

It is not news that soldiers must be trained to do their jobs. They must be trained so that each Army job is performed competently--regardless of differences in ability and background of entering soldiers. To accept less would cause many mission elements to fail.

Many Army jobs are increasingly dependent upon the soldier's ability to use high technology and the ability to learn new technology as it develops. Soldiers, therefore, need more than training. They need enough education to learn subsequent jobs, to become eligible for promotion, and ultimately, to provide leadership for tomorrow's Army.

The Job Skills Education Program (JSEP) is designed to provide soldiers with job-related basic skills instruction that is prerequisite to learning their skill level 1 and 2 job tasks. Based on an extensive job analysis of the 94 most populous Military Occupational Specialties (MOS) and of tasks contained in the Soldier's Manual of Common Tasks, JSEP provides functional basic skills instruction to support MOS specific requirements.

As it is conceptualized, the JSEP curriculum recognizes that the vast majority of soldiers will have been exposed to similar basic skills instruction before entering the Army. Many entering soldiers, however, will not have learned those basic skills well enough or will not remember what they learned. To help soldiers learn better and remember more, JSEP incorporates straightforward training in research-based learning strategies that are directly aimed at improving learning and retention.

Research Objective

The solicitation required:

> A review of the job task analysis and clustering schema developed by RCA to determine their suitability for FBSEP II. Subject to agreement by Contracting Officer's Representative (COR), contractor has the option of adopting or modifying the MOS clustering schema.
> The product of Task 3 will be a viable plan for clustering MOS baseline skills.

The objective of the RCA Educational Services (RCA) effort was to provide the basis for later development of terminal learning objectives. When the solicitation was issued the program acronym was FBSEP II (Functional Basic Skills Education Program II). The program Florida State University (FSU) is developing was changed to Job Skills Education Program (JSEP) at the Task 1 in-process review (IPR); the change was primarily a name change. RCA analyzed tasks for Basic Skills Education Program I (BSEP I) and Basic Skills Education Program II (BSEP II). FSU summed the data from BSEP I and BSEP II to form the basis for the JSEP program.

Scope

We conducted a thorough and detailed review of the RCA job task analysis procedures and products including their approach to clustering. Except for minor changes, we found the work by RCA to be useful and helpful; consequently, we accepted and incorporated the results of the job analysis and the resultant taxonomy into the lesson design. For many reasons, both RCA and FSU rejected the clustering schema as not being useful or relevant to the development effort.

Job Task Analysis

The MOS Baseline Skills Analysis conducted by RCA and sponsored by the US Army Training and Doctrine Command (TRADOC) was a thorough analysis of the tasks performed by level 1 and 2 soldiers in the 94 MOS. The information derived is printed in several forms. The principal RCA products used in our design effort were the following:

- Complete Extended Tasks Analysis Procedures Results (for each MOS)
- Prerequisite Competencies (PC) Indicator Statements (for each MOS)
- Complete Prerequisite Competency Indicator Statements (for each PC)
- MOS-PC Matrix

Our development of the lesson specifications based on RCA's analysis is documented in the Task 5 Report.

BSEP I tasks were those taught in initial entry training and BSEP II tasks were those taught on the first job assignment. FSU assumed that the tasks taught in BSEP I would continue to be used on the first job assignment.

Clustering

Clustering was approached in two ways: clustering by MOS as called for in the solicitation and clustering by PC.

As we understood it, the rationale for clustering PCs by MOS would seem to be based on a requirement for each of the proponent schools to deliver MOS-related instruction. Traditional forms of instruction have been based on the average requirements of those in the class. From that perspective, delivering paper and pencil instruction for the 94 MOS on 201 skills would present an overwhelming logistical problem. A second reason for clustering could have been to improve the efficiency of lesson development, since developing separate instruction for the 94 MOS on 201 skills would mean an extensive duplication of effort.

According to the solicitation, we had the option of adopting RCA's clustering schema, modifying it, or arriving at a new one. To make an informed and rational choice, we studied RCA's clustering report and curriculum report and then tried five alternative methods of clustering to see what kind of solution would result.

Based on our understanding of the requirement, our analysis of the RCA reports, and our own clustering efforts, we concluded that there is no underlying commonality in the raw data that can be discovered through clustering. Further, since the instructional program is designed to give soldiers specific training on only those PCs where they have deficiencies, any clustering scheme would result in some soldiers receiving instruction on material they already know or on material which is not required for their MOS.

APPROACH

The RCA Approach

RCA coded the data two ways: as ratio data (the percentage of indicator statements for each PC for each MOS) and nominal data (whether or not there were indicator statements for that MOS). They used the Statistical Analysis System (SAS) package to obtain clusters of MOS. RCA also used the Comprehensive Occupational Data Analysis Programs (CODAP) Job Special Program to obtain job descriptions for each of the clusters.

RCA collapsed the PCs into PC series. For example, PCs 1a through 1i, Numbering and Counting, are treated as one entity as are 2a through 2g, Linear, Weight, and Volume Measures, and so on. For each MOS, RCA rated each PC series as "comprehensive," presumably meaning that the soldiers in that MOS took all the lessons in the series, or "selected," meaning that the soldiers took some portion of that PC series. RCA analyzed each PC series for each MOS for BSEP I and BSEP II separately.

Expected outcomes. If there are homogeneous groups of MOS, they should cluster together with fairly small measures of difference (in the SAS case, the measure is the sum of the squared differences) and that clustering should be fairly stable; that is, MOS which are actually alike in PC requirements should cluster together consistently.

For a full description of RCA's clustering methodology see RCA's Scientific and Technical Report, BSEP I and BSEP II Clustering (1983).

The FSU Approach

FSU analyzed each of the 94 MOS by the following methods:

- o Armed Services Vocational Aptitude Battery (ASVAB) subtest cut-off scores
- o proponent school
- o job areas (such as communications, maintenance, repair, storage and supply)
- o two statistical analyses using CODAP.

FSU summed the BSEP I and BSEP II data to get the JSEP profile. The rationale for combining BSEP I and II is that the instruction on a specific competency is likely to be the same whether in initial entry training or on the first assignment. For example, skills like "identify measures of ounce, pound, gram" are independent of the time or location where they are taught or performed.

We ran the RCA data through CODAP clustering programs twice, one time for the abbreviated or collapsed data (35 topic areas) to look at MOS clusters, and one time on all 201 PCs to look at possible PC clustering for the curriculum model.

To analyze the data for the collapsed MOS, we assigned rating values based on RCA's classifications:

- Comprehensive was rated 3.
- Selected was rated 2.
- The PC series not in the MOS profile summary was rated zero.

After this was done for both BSEP I and BSEP II, the two data files were added together to get one JSEP file. Each MOS by PC cell had a zero, 2, 3, 4, 5, or 6 in it. The range looked reasonable for a CODAP data input file. The cell values were as follows:

0 meant there were no instances of a PC for an MOS;

2 meant it was "selected" for either BSEP I or II but not both;

3 meant it was "comprehensive" (all PCs in the series) for either BSEP I or II but not both;

4 meant the PC was "selected" for both BSEP I and II;

5 meant it was "selected" for one BSEP and "comprehensive" for the other;

6 meant it was "comprehensive" for both BSEP I and II.

For clustering on PCs, we also transposed the PC by MOS matrix and clustered the PCs rather than MOS to see if that clustering would provide the same help in developing a curriculum model that it provides in occupational surveys.

RESULTS

Clustering Results

Analysis revealed little or no commonality among RCA's four cluster analyses, BSEP I and BSEP II by both ratio and nominal versions of the same data base, and FSU's CODAP analysis of the same data. Table 1 shows a comparison of the five cluster analyses for one of the clusters. The clusters used in the example were the ones that included the common tasks (MOS 000). Only 15 of the 24 MOS in the first column were repeated even once in another cluster.

We could also find no consistent relationships in the data using a priori clustering decisions, such as ASVAB subtests or proponent school, to interpret the SAS data. Table 2 shows two clusters with their ASVAB subtest score and school. If there was internal consistency within a cluster, some of the factors should be the same or the grouping of MOS should at least have face validity.

For example, the first four MOS in the BSEP II cluster (11B, 11M, 19D, and 19E) have the same ASVAB subtest score and are all combat MOS, but come from two different proponent schools. In addition, they are grouped with three MOS that represent two other ASVAB subtests, another school, and include: a tank mechanic (63N), a station technical controller (32D), and a wire systems installer/operator (36C).

Analysis by PCs for Curriculum Model CODAP Analysis

We ran the transposed MOS-by-PC data through the CODAP DIAGRAM program. The within overlap values were not high, usually in the 50% range for 2 or 3 PCs. For examples, see Table 3.

The overlap means that about half of the MOS shared the PCs in the group similarly. That is, PCs 1a and 1h were shared similarly by 54.8% of the MOS in the cluster.

Job Descriptions of Final Clusters

A potentially more useful technique used by RCA for the cluster analyses is the CODAP job descriptions. For each cluster the PCs are rank ordered by percent of members performing. The data would be more useful for establishing lesson development priorities if it were presented for all of the 94 MOS combined. Since the reports are on clusters of MOS, rather than redo the analysis with all 94 MOS, we made hand counts of the number of MOS represented in each PC in the MOS-PC Matrix in Appendix A.

Table 1

Comparison of Cluster Results

RCA SAS Cluster Ratio data BSEP I	RCA SAS Cluster Ratio Data BSEP II	RCA SAS Cluster Nominal data BSEP I	RCA SAS Cluster nominal data BSEP II	FSU CODAP BSEP I&II
000	000	000	000	000
*05G	12B	11B	12B	05G
*11B	94B	11M	45K	11B
*11C		19D	68D	11C
*11H		19E	68J	11H
*11M		32D	68M	11M
13B		36C		17B
15E		63N		19D
*19D				19E
*19E				54E
27E				68B
32H				82C
*54E				91B
55D				93J
57H				95B
*63N				95C
67G				
68F				
68H				
*68J				
*68M				
*91B				
*93J				
*95B				
*95C				

*Indicates MOS is repeated in another cluster

Table 2

Selected Clusters With MOS, ASVAB Subtest, and School

RCA SAS Cluster BSEP I (nominal data)			RCA SAS Cluster BSEP II (nominal data)		
MOS	ASVAB	SCHOOL	MOS	ASVAB	SCHOOL
11B	CO85	BENN	12B	CO85	BELV
11M	CO85	BENN	45K	GM95	ABER
19D	CO85	KNOX	68D	MM100	EUST
19E	CO85	KNOX	68J	GM95	EUST
32D	EL95	GORD	68M	GM90	EUST
36C	EL90	GORD			
63N	MM95	KNOX			

Table 3

Overlaps for Selected PCs

PC	Overlap
1a and 1h	54.8
2g, 4c, and 41e	50.4
1c and 5a	52.9
11b, 26b, and 26a	52.6
4a and 4b	45.4

DISCUSSION

Cluster Analysis

The results of the analyses were used to make inferences or decisions about MOS clustering, uses of MOS clustering, and the curriculum model.

RCA raised several clustering and curricula model questions. A review of those questions and RCA's answers follow:

1. What is the potential program content that the curricula models should address?

   The basic unit of data entered into the clustering solution is percentage of frequency of occurrence of PC on an MOS by MOS basis. That is, for each MOS the frequencies of occurrence of PCs was converted to a percent. The basic data for curricula model development are the PC statements.

2. How should the remediation content be divided into curricula modules? What are the modules? How should lessons be derived for modules?

   Since MOS are clustered and not PCs, the clustering solution did not help answer this set of questions. The only condition under which clustering results may assist to answer this set of questions is if certain a priori assumptions were made, such as develop similar modules for combat arms MOS. No such a priori assumptions appear defensible.

3. How should the curricula modules be arranged into a course map? Instructional sequence?

   The best data for course map construction and instructional sequencing can be gained from extended task analysis results and through inspection of entries on the taxonomy. The clustering solution offers no additional information, nor does it add any efficiencies to this decision-making process.

FSU has examined RCA's written reports, CODAP diagrams, Job Special Reports, and the Statistical Analysis System (SAS) clusters. We agree with RCA's conclusions that clustering does not provide guidance for curriculum development. We believe the principal reason to be that there is no underlying commonality represented by the clusters. Each clustering, although all had a slightly modified version on the same data base, yielded a different set of clusters, a finding we infer to indicate a random process.

The outcome was more than 20 not very similar MOS in each cluster. For example, the fact that both an Indirect Fire Infantryman (11C) and an Aircraft Weapon Systems Repairer (68M) have many indicator statements for PC 26d is just as likely a result of the analysts who worked on those MOS as it is inherent likeness in the basic skill needs of those MOS, but the SAS or CODAP programs would interpret that as a similarity.

Although we have not found clustering to provide a better tool for curriculum design, we do not view this as a problem in JSEP. The management system being developed decreases the need for clustering MOS either for development or for delivery of instruction. We have concluded that clustering by MOS could create inefficiencies in both.

If JSEP is intended to provide the PCs that soldiers need to learn their job tasks, and it is not intended to train soldiers in their job tasks, then the lessons should, as much as possible, teach the skills in an Army-wide context. Where MOS have specific applications of the skill, those MOS may be given instruction in their specific applications. For example, only MOS 94B, Food Service Specialist, uses measures such as cup, teaspoons, and tablespoons. Those measures should be included in a short MOS 94B unique lesson segment.

Curriculum Model

Our analysis of RCA's proposed curriculum model focused on two main points: The Army's use of the model for implementation and management of the curriculum, and, FSU's use in lesson development. (A complete description of RCA's curriculum model is presented in their Scientific and Technical Report BSEP I and BSEP II Curricula Model Analysis, 1983.)

The Army's Implementation and Management

RCA has presented a complete, sequenced, and interdependent curriculum model. RCA's report on BSEP I and BSEP II Curricula Model Analysis describes the rationale for their proposed curriculum. Excerpts from the report are attached as Appendix B.

If soldiers were to follow such a curriculum, it appears that they would have to take more lessons than are required by their MOS. For example, 13F, Fire Support Specialists (13F) have PC 38a, "Enunciate clearly using proper rate of speech." The RCA Model indicates that a series of lessons are prerequisite to PC 38a. These are shown in Figure 1.

The 38a PC occurs in three modules, which makes 28 lessons (about 28 hours of instruction based on RCA's time estimates) in order to take required 38a lesson. About 12 lessons include PCs which are not required for MOS 13F, according to the Extended Task Analysis Procedure Results (ETAP). Given the way the PCs are grouped in the curriculum model, we assume that the 13Fs would have to take the additional 12 hours in order to take the 38a lessons.

Taking lessons on PCs not required for an MOS is only one problem. The other is the logic for making PCs prerequisite to other PCs. Is there an empirical basis for making the following list of PCs prerequisite to PC 38a "Enunciate clearly using the proper rate of speech"?

26b Recognize task-related words with technical meanings.

38A. ENUNCIATE CLEARLY, USING THE PROPER RATE OF SPEECH

38F. SOLICIT FEEDBACK TO CONFIRM THE ACCURATE RECEPTION OF THE COMMUNICATION

38G. RECOGNIZE WHEN A LOW-KEY, INFORMAL DIALOGUE IS SUITABLE

38H. RECOGNIZE WHEN DIRECT VERBAL COMMANDS ARE NECESSARY

38I. RECOGNIZE WHEN A PRESCRIBED SERIES OF VERBAL INTERACTIONS IS REQUIRED TO COORDINATE A GROUP EFFORT

38J. RECOGNIZE WHEN THE SITUATION WILL REQUIRE A STRUCTURED, PREPLANNED METHOD OF PRESENTATION

38A. ENUNCIATE CLEARLY, USING THE PROPER RATE OF SPEECH

38B. USE TECHNICAL VOCABULARY SUITABLE TO THE TASK AND LEVEL OF THE PERSON

38F. SOLICIT FEEDBACK TO CONFIRM THE ACCURATE RECEPTION OF THE COMMUNICATION

38A. ENUNCIATE CLEARLY, USING THE PROPER RATE OF SPEECH

38C. DETERMINE THE APPROPRIATE AMOUNT OF INFORMATION TO COMMUNICATE

38F. SOLICIT FEEDBACK TO CONFIRM THE ACCURATE RECEPTION OF THE COMMUNICATION

38E. FOLLOW HIGHLY DETAILED, STEP-BY-STEP DIRECTIONS

38D. INTERPRET FIGURATIVE OR IDIOMATIC LANGUAGE BY REFERENCE TO ITS USE IN CONTEXT

25D. DETERMINE THE ESSENTIAL MESSAGE OF A PARAGRAPH OR SECTION OF WRITTEN MATERIAL

25E. INFER FROM A WRITTEN SOURCE, WHICH DOES NOT EXPLICITLY PROVIDE REQUIRED INFORMATION, IN ORDER TO MAKE A DECISION

26B. RECOGNIZE TASK-RELATED WORDS WITH TECHNICAL MEANINGS

26C. IDENTIFY THE CORRECT MEANING OF A WORD FROM THE CONTEXT OF A SENTENCE

26E. DETERMINE THE MEANING OF FIGURATIVE, IDIOMATIC, AND TECHNICAL TERMS BY USING CONTEXT CLUES OR BY USING A REFERENCE SOURCE(S)

25A. IDENTIFY FACTUAL DETAILS OR SPECIFICATIONS THAT ARE FOUND WITHIN A STATEMENT OR WRITTEN SELECTION

25B. SELECT PARTS OF TEXT AND VISUAL MATERIALS TO COMPLETE A TASK ACTIVITY

26A. RECOGNIZE COMMON WORDS AND THEIR MEANINGS

26D. RECOGNIZE THE MEANING OF COMMON CONTRACTIONS, ABBREVIATIONS AND ACRONYMS

41H. INTERPRET CODES AND SYMBOLS

25C. FOLLOW HIGHLY-DETAILED, STEP-BY-STEP DIRECTIONS IN ORDER TO ACCOMPLISH A SEQUENCE OF TASK ACTIVITIES

26A. RECOGNIZE COMMON WORDS AND THEIR MEANINGS

26D. RECOGNIZE THE MEANING OF COMMON CONTRACTIONS, ABBREVIATIONS AND ACRONYMS

41H. INTERPRET CODES AND SYMBOLS

FIGURE 1: RCA MODULE CONFIGURATION SHOWING PREREQUISITES FOR 38A. ENUNCIATE CLEARLY USING THE PROPER RATED SPEECH.

26c Identify the correct meaning of a word from the context of a sentence.

26e Determine the meaning of figurative, idiomatic, and technical terms by using context clues or by using a reference source(s).

25d Determine the essential message of a paragraph or section of written material.

25e Infer from a written source, which does not explicitly provide required information, in order to make a decision.

38d Interpret figurative or idiomatic language by reference to its use in context.

38e Follow highly detailed, step-by-step directions.

38f Solicit feedback to confirm the accurate reception of the communication.

Lesson Development

In the FSU JSEP curriculum model there is no single required sequence. There is a comprehensive block of lessons, the 94 MOS, a large JSEP-eligible population, and a sophisticated management system. A course of study will be prepared for each soldier, based on his or her MOS requirements, modified by the individual's tested strengths and deficiencies, and will accommodate unit work requirements through flexible scheduling. The lesson sequence for each soldier will be based on hierarchical or logical relationships among lessons, MOS, time constraints, and education center capacity and schedules.

Suspected hierarchical or dependent relationships between lessons are usually arrived at more by the logic of the analyst than by empirical validation. For instance, the RCA original taxonomy puts quantitative PC lessons in "school" order, an arrangement that we have followed for the time being. The verbal PC lessons loosely follow RCA's original "simple to complex" order. The sequences can be and should be changed, based on data collected during the lesson tryouts.

One method for accepting or rejecting a hierarchical relationship is to test whether the learner can perform the higher order skill with and without the lower order skill.

MOS Specific Lessons or Segments

The FSU lesson specifications call for a core lesson that teaches the PC skill, followed by branches to as many MOS (or MOS group) specific segments as necessary. Some unique MOS applications of PCs have been identified in the lesson specifications; others will have to be identified from the indicator statements or by content experts.

Branches to MOS (or MOS group) specific lessons or segments will have to be based on a careful review of the indicator statements for each MOS for each PC. For example, some PCs such as 32a, "Locate the block on a form to enter the appropriate information," represent very general skills. The indicator statements for one MOS are very much like those for any other MOS. Examples used in the instruction should transfer readily to the applications for all MOS. The assumption of transferability should be verified, but limited access to the target audience will restrict empirical testing. It is recommended that follow up studies address the transferability assumption.

Other PCs such as 5b, "Interpret the number, word, symbol from a display readout," can be fairly neatly divided into three main groups: Some of the MOS that require PC 5b, like 24C, 33S, and 82C, have advanced digital displays. Another group, the maintenance and electronic MOS, have meters like a multimeter to read, and a third group, armor, infantry, engineers, and truck drivers, have a variety of gauges to interpret. Each group may have a unique 5b segment.

SETTING PC LESSON DEVELOPMENT PRIORITIES

Developing detailed instruction for all PCs would result in far more than the approximately 420 hours required under this contract. Whereas some PCs will require only about an hour to complete, some will take far more, such as 36f, Apply common rules of grammar, which will probably require many hours of instruction and practice. Short lessons will be developed for approximately 170 testable PCs. (See Table 4.) In an attempt to establish priorities for long lesson development, we recommended a method for selecting those PCs to be developed first.

We proposed that the factors listed below be taken into account and lessons tentatively rated high, medium, or low priority:

- How many MOS require the PC?
- What is the density of the MOS which require the PC?
- Are there common tasks which require the PC?
- Are other PCs dependent on the PC?
- Are there compatible job-related existing materials that can be integrated into JSEP for the PC?
- How did the TRADOC schools rate the PC?
- Is the PC related to the General Technical (GT) portion of the ASVAB?

Table 4

PC's Labeled Not Testable in the JSEP Context
By Educational Testing Service

4c Estimate time in seconds, minutes, and parts of an hour

15c Label all parts of geometric figures using mathematical and characteristic designators.

25b Select parts of text and visual materials to complete a task activity.

28b Obtain a fact or specification from an intersection of a row by column table or chart.

29a Identify details, labels, numbers, and parts from an illustration or picture.

30c Translate the significance of the symbols into physical activities

31a Isolate each major section or entity presented in a schematic diagram.

32a Locate the block on a form to enter the appropriate information

32d Write a descriptive account of an activity or transaction performed

34a Distinguish between major and subordinate topics.

37a Individual - a person working on a task and communicating with another when assistance is needed or when a supervisory decision is needed.

37b Instruction - a task activity requiring communication between an instructor, an individual or small group where the purpose is to give facts or rules to inform or guide.

37c Tutor - interaction takes place between two persons where one is instructing and the other is doing the task.

37d Peer Group (less than 10) - all members engage in an activity where one person assumes a leadership role and communicates to others what is to be done.

37e Interview - a person communicating with another about his activities, opinions, or subject expertise for the purpose of using the information in a task.

37f Briefing - communicating final instructions to others or giving an account in summary.

37g Counsel - communicating together to exchange ideas or opinions to recommend, give or take advice, or to arrive at an acceptance of a plan or decision.

Table 4 continued

37h	Command - communicate to others an order or action to be taken where a person has a position of authority.
38a	Enunciate clearly, using the proper rate of speech
38b	Use technical vocabulary suitable to the task and level of the person
38d	Interpret figurative or idiomatic language by reference to its use in context
38e	Follow highly detailed, step-by-step directions
38f	Solicit feedback to confirm the accurate reception of the communication
38g	Recognize when a low-key, informal dialogue is suitable
39a	Recognize the need for clear, concise directions in order to avoid language or word-meaning differences
39b	Recognize personality factors and inter-personal relationships that may exist
39c	Recognize feedback as a means of communicating more effectively and increasing task competence
40a	Use common knowledge to avoid hazards in order to prevent injury to self or equipment
41f	Determine direction, duration, and intensity of sounds, sightings and smells
41g	Infer from sights, sounds, touch, smells, or tastes to determine a course of action

Number of MOS

In order to answer the first question, the RCA MOS-PC Matrices for BSEP I and BSEP II are consolidated. The number of MOS were counted for each PC (see Table 5).

For all the 1 PC series except 1i, there were so many MOS for each PC that there was too little additional information to be gained looking at the rest of the questions. PC 1a through 1h were tentatively designated high priority. PC 1i has only 35 MOS and will be classified medium priority.

MOS Density

For 18a, most MOS were medium density but there are two with very high density, 11C with about 12,000 soldiers and 76Y with about 19,000. Therefore, 18a is a medium priority. For 18b and 18c, all of the MOS have relatively fewer soldiers, therefore 18b and 18c will have a lower priority.

Common Tasks

PC series 1a - 1i (except 1g) all have common tasks (indicated by 000 under MOS heading on Table 1). PC 1a through 1h are already high priority, so no reconsideration will be made. PC 1i, however, had previously been classified medium priority and would probably be reclassified high priority.

Dependent PCs

Some PCs are prerequisite to other PCs (see Table 6). If a PC is prerequisite to a high prioritv PC, it too, must become a high priority (see Table 5). PC 1c, 1d, and 1e are prerequisite to 1f. If 1f is a high priority, all three, 1c, 1d, and 1e, should become high priority.

TRADOC Priority

TRADOC surveyed the proponent service schools to obtain priorities for all JSEP MOS. The schools rated each PC for each MOS as:

- A PC already taught in Advanced Individual Training (AIT)
- 1 Unanimous agreement priority one PC
- 2 Mixed responses mostly positive
- 3 Mixed responses mostly negative

The schools further rated each PC as to whether it was difficult for soldiers who lacked the competency to learn their jobs. An A, 1, or high difficulty rating increases the FSU priority rating.

Table 5

MOS-PC Matrix - Combined BSEP I & II Math

MOS PC

MOS	01a	01b	01c	01d	01e	01f	01g	01h	01i	02a	02b	02c	02d	02e	02f	02g	. . .	18a	18b	18c	19a	19b	19c	19d
000	*	*	*	*	*	*		*	*	*	*	*		*	*	*								
05B	*		*		*			*				*				*								
05C	*		*		*			*				*				*		*						
05G	*		*	*	*	*		*				*				*								
11B	*	*	*	*	*	*	*	*		*	*	*			*	*								
11C	*	*	*	*	*	*	*	*		*	*	*			*	*	. . .	*						
11H	*	*	*	*	*	*	*	*		*	*	*	*		*	*								
..																								
..																								
..																								
76P	*	*	*	*		*	*	*																
76V	*	*	*	*		*		*				*	*		*	*								
76W	*	*	*		*	*	*	*				*		*	*	*								
76X								*										*						
76Y	*	*			*			*								*								
82C	*	*	*	*	*	*	*	*	*	*	*	*			*	*		*		*	*	*	*	*
91B	*	*	*	*		*	*	*		*	*	*		*		*								
93J	*	*	*	*	*	*	*	*	*		*	*				*								
94B	*		*				*	*				*	*	*	*	*								
95B	*	*	*	*	*	*	*	*	*	*	*	*	*			*	. . .							
95C	*	*	*	*	*	*	*	*			*	*	*			*								
96B	*		*	*				*								*		*						
TOTALS	93	59	80	67	71	62	54	93	35								. . .	26	04	04				

Table 6

Example of PC Dependencies

Prerequisite PCs	Superordinate PC 1a	1b	1c	1d	1e	1f	1g
1a		x					
1b				x			
1c						x	
1d						x	
1e						x	
1f							x
1g							
1h						x	
1i		x					

GT Relationship

If a PC is GT related it automatically becomes high priority. A PC is GT related if the PC matches the skills tested on the GT.

Existing Materials

A PC could be reduced in FSU development priority if JSEP compatible existing materials were available. If McFann-Gray's (MGA) lesson "Introduction to Numbers" matched the indicator statements for PC 1a then PC 1a would be taught using the McFann-Gray lesson. The MGA materials are primarily drill and practice. They may be programmed on one or both of the computer systems used to deliver JSEP.

Level of Difficulty

RCA recommended developing instruction at two difficulty levels. Since there is not yet any data on what would be difficult for the target audience, FSU chose to prepare a short lesson on each PC of the approximately 170 PCs that Educational Testing Service (ETS) declared testable. Long lessons will then be developed for higher priority testable PCs.

TRADOC collected subject mater expert (SME) opinions on whether lack of a PC would make job task performance difficult. That is a different estimate of difficulty.

Raising General Technical Aptitude Area (GT) Scores

One goal of BSEP, BSEP II, and the JSEP programs is to increase the chances that soldiers taking the instruction could prepare themselves to be eligible for reenlistment. When soldiers are eligible for reenlistment, based on their test scores, the Army can choose from a much larger population those to recommend for reenlistment based on their job performance and service records.

Identifying soldiers who need to raise GT scores will be a part of the JSEP management system. JSEP soldiers with GT scores within the range of eligibility can go through the PCs that match the skills tested on the GT (arithmetic, reasoning, paragraph comprehension, and word knowledge).

CONCLUSIONS

FSU conducted a thorough analysis of the products from the TRADOC-sponsored project that was conducted by RCA:

Product: The RCA Job task analysis of 94 MOS.

Finding: Useful and helpful; job analysis and taxonomy incorporated into the lesson design with minor changes.

Product: Two clustering approaches suggested by RCA.

Finding: RCA's clustering approaches were analyzed along with several alternative methods. We agree with RCA that clustering does not provide guidance for curriculum development.

Product: RCA's proposed curriculum.

Finding: We have found no underlying empirical support for this model and suggest a replacement for it.

Based on our analysis of all RCA contract products and our understanding of the Army requirement, we recommended that the clustering approach be abandoned.

In its place, we recommend a JSEP management model that accommodates individual soldiers. This model uses test scores to establish a soldier's curriculum, then sequences the instruction based on soldier progress and performance on the lessons.

This approach appears to be totally consistent with the capabilities of JSEP and the general requirements in the Statement of Work.

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APPENDIX A

MOS BASELINE SKILLS PROJECT
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MOS/PC MATRIX - BSEP I VERBAL   28 JUNE 83   PAGE 1

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      222222 22222 2222222 2222 222222 333 33333 33333 3333 3333 333333333 33333333 33333333 3333333333 333 444 44444444
      555555 66666 7777777 8888 999999 000 11111 22222 3333 4444 555555555 66666666 77777777 8888888888 999 000 11111111
MOS   ABCDEF ABCDE ABCDEFG ABCD ABCDEF ABC ABCDE ABCDE ABCD ABCD ABCDEFGHI ABCDEFGH ABCDEFGH ABCDEFGHIJ ABC ABC ABCDEFGH
000   ***    ***** * ** *  ** * *****            *****  *         * *** *           ******** **** ****  *** *** ********
05B   ***      ***   * **  **** *   **         *     *  *                 *     * *                         **  *   ***
05C   ***      ***   * **  **** *   **               *  *                 *     * *                         **  *   ***
05G   * **** ** ** ******  **    *               *****  **       ****** *   * **  * *** *    ****** **      **  **** ***
11B   ****   ***** *****    * * ***              ****  **         * *       *       ******** **** * *** * * *** ********
11C   ****   ***** * ****  **** **  **           ***** **                   *     * ****   * ****** *** * * *** ********
11H   ****   ***** ** * *  ** * **  *            *****  *          *        *       ****   *  *** * *** * * *** ********
11M   ***    ***** *  * **  * * ***              ****  **   *               *       **** * * ******  ** * * *** ********
12B    *     ***** *                                                                *  *-  * *              **  ********
13B   *** *  ***** **** *   *** *      *         **  *  *                           ** *   *                **  *******
13E   *** *   * **         ** * ***  *           *****                       *      ***    * *   **  ** *   **  * *****
13F    **     ****   ***   **** **  *                *  *                           **       *    *  *      *** * *****
15D   ***       **      *  **                        *                                                      *   * * ***
15E   *** *  ** ** ** ***  **** **               *****                      *       ** *   * **  * ***      *** *******
16D    ** *  * ***   *     **** *   *                   *          *                                        *** *  ****
16E   * *    * *** * *  *  **** *   **               *                                                      *** *   ***
16H   ****      ** ******* ****         *        ***** **                   *       ** *     *** ** **  * * *** ********
16P   * *     * *          ****                  **                                 **** * * *** ** ***     *** ********
17B   ***     ***  * ** *  **** **   *           ***** *                            **** *    ****      *   *** ********
17C   * *     *  * ** * *   * * **               *****                      *       *  * * * *** *          **  * ******
17K   **** * ***** * ** *  **** **               ****   *           *       *       *  *      *             *** * ******
19D   ***  * ***** *  ***  ** * **               *****  *         * *       *       ** *** * ****** *** * * *** ********
19E   ***  * ***** * ****  ** *                  *****  *           *       * *     ***** ** *** **  *  * * *** ********
24C   ****** ***** ******* **** ****** *** ***** *****                              ********  *  *** **   * **  ********
24H   *****  ** *  ******  **** * * ** **  ***** *****  *                   *     * ** **     **            *** * ******
26L    **        *   * *   **** *   **               *             *                                         *      **
26Q   *** *     ** * * **  **** *                    *  *                 *       *                         *** *   **
27E   ******  **** ******  **** ** *** **   **   ***** **                   *       *  *      *             *** ********
31J   *****  ** ** ******  **** *****      ***** *****                      *       *  *                    **  ********
31M   *****     ** * * *** **** *   **               *                                                      **  *   ***
31N   * **** ***** **** ** **** * *  *  *  ***   ***** **                  *      * ** *** * ***  * **  * * *** * ******
31V   * *    ** ** *   **   *** ****** *   ***** *****                              ** *     *   **   *     **  ********
32D   ** *** ** ** *  * *   * * *****        *   *****  *   *  * ** **   *  *       *   ** *  ** ** **  *   **  ********
32H   ***  *  * ** * ***** **** *   **     ***** *****                     **       * **      *   *         *** * ******
33S   ******  **** ******* **** **** *  ** ***** ***** **                   * *     *****     *** ***    ** **  ********
35K   ***    ** ** * **         ** * *      **   *****  *                           *  *  *  ***  *  *   ** *** * *****
36C   ***    ***** *****    * * ****       **    *****           *          *       ****   * ****** *   *   *** **** ***
36K   *       **      *                          *****                      *       *  *   * ***  *         *** * ** **
43E     *    ** ** *  *     * * *   **           ****                                                       **  * ** **
43M   ***       ** *   *   **** *    *               *             *                                         *  *   ***
44B   ***   *  *** * * *** **** *   **               *                                                      *** *   ***
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      555555 66666 7777777 8888 999999 000 11111 22222 3333 4444 555555555 66666666 77777777 8888888888 999 000 11111111
MOS   ABCDEF ABCDE ABCDEFG ABCD ABCDEF ABC ABCDE ABCDE ABCD ABCD ABCDEFGHI ABCDEFGH ABCDEFGH ABCDEFGHIJ ABC ABC ABCDEFGH
44E   ***       ** *   *   **** *   *                *  *                                                   **      ***
45B   ***    ***** ****     *** ** **            *****                      *       *                       *** **** ***
45K   *** ** ** ** ******* ** * ****    *  ***** *****  *                           ** * *                  **  * *****
52C   ****** ****  **** *   *** ****       ***** ****  **                   *       *  *      *             *** ********
52D   ****   ***   ****    **** ** *       ***** ***** **                   *       * **      *             **  ********
54E   ****** ***** *******  *** **               ***** * *   **    ** *    **  *  * ******** *** *  *** *** *** ********
55B   **  *   ** * ******  **** ****             ***** **                  ****   * *  *   *   * ** **      *** ********
55D   ****   ***** * ***** **** ** ***  *   ***  ****  ***                  *       ** *** *   * **  ** *** *** ********
57E   ***    *  **   *  *  ****      *               *  *                 *                                 *   *   * *
57H   **** * ** ** *  **        * *  *           **  *                              ** **  *     *        * *** *******
61B     * *      *           *                          *                                                   *** *   ***
61C   **** * **    * ****  ** * * *  *  *        ***** *                          * *                       *** ********
62B   *** ** *** * *****   ** * **         *     ***** *                            *  *                    **  * *****
62E   *** *  ** ** *  * ** ** * *    *           *****                      *       *                       **  ********
63G   ****   ***** **** *  **** *****  ***       *****                              *  *   *  **            *** ********
63H   ****      ** * * **  ****                      *  *                                                   *   *   **
63N   *****  ** ** * *****  * * ** **        **  *****  *                   *       ** **  * ******* *    * *** ********
63W   *** *     **   * *** **** *   **               *                    *                                 ** **   ***
64C   ****    *  * ****     *** ***     *        ***** **         * **      * **  * *  * *   *** **         *** ********
67G   *** ** ***** * ***   ** * **  **           *****  *        *         **       ****   *  *  *   *    * **  ********
67N   **** *  **** ******  **** *****            *****  *     *                   * *  *      *  *          **  ********
67T   ***    ** *  ****  * ** * * ** *           *****                    ***       *  *      *             *** * ******
67U   ****      ** * * **  ***  *                    *  *                 *       *                         **  *   **
67V   **** * ***** ******  ***  *****            * *** ****                *      * * **      *           * **  ********
67Y   ****   ***** ******  **   ** *             *****  *                         * *      *      *         **  * *****
68B   **** * ***** *****   **** ******  *  *     ***** ** *      *                  ** * * * ***  *  *  * * **  ********
68D   ***  * ****  *  *    **** *****            ****   *                           *  *  *    *            **  * ******
68F   * ***  ** *  *  *  *  * *            * *** ** **                              *          *          * **  * ******
68G   ****     *** * * **  **** *   **               *  *                         *                               * ***
68H   ****    **** ******* **** *****            *****  **                 **     * *            *          *** ********
68J   **** * ***** * ****  **** ******     *** * ***** ***                 **     * ** *      *   *  *      **  ********
68M   * * *  ***** **** **  *** ******  *  ****  ** **  *                           ** *      *   *  *  **  **  ********
71D   *****     *  * * *** **** *    *            ****  *          *      *     * * *                              ** *
71L  ****** * * * ** **** ***** *    *          **** *  *          *      **    * * ** *  *                 *  **  *****
71M   ****    *    ** *                          ***** ***                  ***** * ****  *    * * *     *  *** ********
71P   ***    ** ** ***** * ** * *   *            *****  *                         * **   *    ** **         *** *  * ***
71Q   *****      * * * *** **** *   **               *  *          *            * *                          *  *    **
72E   ***     *    ** ** *  **          *        ***** **                  **** * * * **       *            *** ********
74D   *****  ***** * ** ** **   **         *      * **  *           *               **       ***  *     *   *** * ******
74F   ****** **  * ******* **** *      ***  *    ***** **** ***  ****       * *** * ****      **  *     * * **   *  *  *
75B   *** *        ******* **** *    *               *  *          *    * *   * * *
76C   **     ** *  *   **  **                    *****                            * *                           * ***
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MOS    ABCDEF ABCDE ABCDEFG ABCD ABCDEF ABC ABCDE ABCDE ABCD ABCD ABCDEFGHI ABCDEFGH ABCDEFGH ABCDEFGHIJ ABC ABC ABCDEFGH
76P    ****   ** *  **** *  ***          *        *****                              * ***     *              *   *  ****
76V    * *    **     *   *   *                    ***** ***                          * **      ***            **  * *** *
76W    * *     **    * *    ** * *  *          *  *****  *                   *       * *  *      *            *** *******
76X    * *       *  *   **  ****                      *                                                       **  *   * *
76Y    *       *    ** ***  ** *                  *****                      * *     ****        *             ** ***  *
82C    *****  ***** * ** ** **** *   *            ***** ** *                         *  *             *   *   **  ********
91B    ****** ***** *    *  ** * *           * ** ***** **               ***  * **     ******** *** *****  *** *** ********
93J    *** ** ** ** ******* ** * **  **           *****  **         *  *  * *   * ** * *** ******  ** * * *** ********
94B    * *     ** *    *         *                 ***                               **   - *   *   *         **  * *****
95B    **** * ***** * **  * ** * **  *            ***** ***   *     ****      *** ** ** ***** ********** *** *** ********
95C    *****  ** *  **** *  **** ***         *    ***** ***         ****      * **  * ******** ******** * *** *** ********
96B    **** *    ** ******* **** *    **     *    **  *  *     *      **       *   *  *   *           *       **  *   * *
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MOS   ABCDEF ABCDE ABCDEFG ABCD ABCDEF ABC ABCDE ABCDE ABCD ABCD ABCDEFGHI ABCDEFGH ABCDEFGH ABCDEFGHIJ ABC ABC ABCDEFGH
000          ***      **      * **  *                   *      *                    ***  ***  **      * *   **  *******
05B    **       ** * * *   ***                       *  *          *                                            *   ***
05C    **       ** * * *   ***      *                *  *          *                                            *   ***
05G   ******  ** * * *****  * * **   *               * ***    *   ** *   * *    * * **  * **   *  * * * * * * * **  ****
11B   *** *  ***** *  * *   * * **                 *                                ****      ** *   *  *   *** ********
11C   * **   ***** *    **    *                  ****  *                            ****** *  ***** **  * * *** ********
11H   * * ** ***** *  **** ** * *** **           *  ** *  *  *                 *    ** * * *  ** **  ** * * *** ********
11M   *** *  ***** ******   * * **  *              *   *          *         *       **** *** ******  ** * * *** ********
12B   ***    *****                                                                  *  *- *                 **  *******
13B   *** ** ***** ******* **** * *    *         *****  *                   * *     *****  * *** ** **  * * *** ********
13E   *** *  ***** * **  * **** **               *****                              ** *   * **  ** *** * * *** ********
13F    **    **  * *  *     ***                                                     **     *                **  * *****
15D   ***    ***** ****     *** ***     *         **** **                           **        **  *  *      *** ********
15E   ***    ** *  **** **  * * *      *          ****  *                           ** *   * **     *       *** ********
16D   ***     * ** ****    **** * *     *        ****  *                            **   *    *             **  ********
16E   ***    ** ** ****    **** * *     *        ****  *                            *    *    ** *          **  ********
16H   *** *    *   * **    ** *         *  **    *****      **   **   * *   *       ** *  ** ***  *  **  ** **  * ******
16P                                                                                    *         *          **   * *  *
17B   **      *       **    *   *                   *                               *    *   **             **  * *****
17C   ***     *  * * **    ***  **               *****  *                           *  *   *  * * *         **  * ******
17K   * *  * *  **   *** * *     *   *           ****            * *    *   *       ** ** ** ***  ** ** *** *** * *****
19D   ****** ***** ******* **** **               ***** ** *        * ** **  *   *   ******** ********** *** *** ********
19E   ***    ***** * *** * ** *                  *****  *                   *       **     * *** **  *   *  *** *******
24C   ****** ***** ******  **** *****   ** ***** *****                              ** ***    *  **  *      **  * ******
24H   ****** ** *  **** ** **** ******     ***** ***** *     *             **       ** * *   ***     *      **  ********
26L                                                  *
26Q    ** *     *  * * **  **** *    *               *  *                 *                                 *** *   * *
27E   *** *   * *   * **   *  * **  *   *        ****   *                   *       *         *             **  * *   **
31J   *****  ** *  ******  **** *****      ***** *****                              *  * *        *         **  *******
31M     *          * * *   **** *   *                *  *                                                   * *     ***
31N   * *    *****   **    ****                  *****                      *     * *****  *  *** ***   * * *   * *****
31V   * *    ***** *    **    * ** **            *****                              ** *   *      *         *** ********
32D    *      * ** *  ***   *                *   *****  *                           **  *  *  **  *         * * * ** **
32H   ***  *  * ** * ****  **** **  *      ***** *****                      *       *  *     *    *       * *** *******
33S   ***    ** ** **** *   * * ******  ** *****   *                                    *     *             *** ********
35K   *** *   **** *  **    *   ** *        *    *****  *                           **       **  *      *   **  ********
36C   *** *  ***   * **    ** * *  * *     *     *****             *       **     * ** * *** *** **  *    * **  ********
36K   ***     **** ****    **** *          *     *****                      *       ** *  ** *** ****** *** *** **** ***
43E   *      ** *  *  *     *   *  **            *  *                                                       **  **** **
43M    *        *           *                        *                    *                                         *
44B   * *      **  ****     *** * *     *         ***  *                            *         *             **  ********
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      222222 22222 2222222 2222 222222 333 33333 33333 3333 3333 333333333 33333333 33333333 3333333333 333 444 44444444
      555555 66666 7777777 8888 999999 000 11111 22222 3333 4444 555555555 66666666 77777777 8888888888 999 000 11111111
MOS   ABCDEF ABCDE ABCDEFG ABCD ABCDEF ABC ABCDE ABCDE ABCD ABCD ABCDEFGHI ABCDEFGH ABCDEFGH ABCDEFGHIJ ABC ABC ABCDEFGH
44E                             *
45B   *      ** *  * **     **  *  **          * *****                      *       *                       **  * ** ***
45K   * *  *       * **  *      ** *        **     *    *                           *                       **  ****  *
52C   ******  ** * ******   *** *****      ***** ***** **                   *       *  *                    *** ********
52D   **** *  ***  **** *  ** * * **        **** ****   *                   *       *  *      **            **    ******
54E   ****** ** ** * ***** **** **   *           ***** ** *        * *  ** **       ********  ** ****** *** *** ********
55B   **  *   *  * * *     ** * ***              ***** *         ***                *  *                    ***  **** *
55D          **         *                      *    *                               *                        *  * *** *
57E
57H    * * * ** *  *  ***  ** * *                ***** *                    *        *     *     *          *** ********
61B    ** *     ** *    ** ****     *                * **                                                   **  * * ***
61C   ****   ** *  *  ***  *  * ***           *  * **     *                         *                       *** * *****
62B   *** ** ***** ***** * **** *****       *    ***** *                    *       *  *                    *** ********
62E    **       *                                                                   *                       **  *  * *
63G   ***     ****   ***   **          **        *****                      *       *  *      **            *   * ******
63H   ****     *** * * **  ***  *   **               *  *                *                                  **  *   **
63N   *****  ***** * ***    *   **  *            *****                      *       ** **  * *   **       * **  ********
63W   *** *     **   * **  **** *   **               *                   *                                  **  *   ***
64C   * *          *                              ****                              *      *                 *  * *   **
67G   ****   ***** * ** *  **   *   *            *****                     **       *  *   *  *             *** ********
67N   ***    ** *  ****    ** * ****    *        *****        *                     *  *      *             *** * ******
67T     *     * *  *  *         *                *****                     **       *         *     *       **    ** ***
67U   ***       ** * * **  ***  *                    *  *                       *                           *   *   ***
67V   *       * ** ****    **   * * *            ****                               *      *  *           * **  ********
67Y   ***     *  * *  **    * * ** **            * ***  *                           *            *          **  * ** **
68B   ****** ***** * **    **** * **             ***** *                            *  *   *        **      **  * *****
68D   *   *  ***   *  *    ** * *****              **   *                           *          *            **  *******
68F   * **   ** *  *  *    ** *               *  *  ** **                           **                      *   * *****
68G   ****      ** * ****  **** *                *   *  *                         *                         **      **
68H   * ***  ** ** * ****  ** * * ****           *****   **                **       ** *       * *          **  * ******
68J   * *    ** *  * **         ****       *        *                               **            *         **  *******
68M    **    ***** * **     *   ****       *****        *                           **            *         **  ********
71D   ******  * *  ***** * **** *    *           *****  *          *   * *      * * *         *                    ***
71L  *  *** *   *** ****** ****      *           *** *  *         **   * *      * * **  **    **   **    **  ****  ** *
71M   *****   * *  *****   ****    * *           ***** **                   *   * * **            *         *** * ****
71P   *** ** ** ** *******  * *  *  *            ***** ***       *** *   *  *     * *** ***    *  ** ** **  *** ** * ***
71Q      *           *   *   **                      *  *                       * *
72E   ***     ***   *****       *       *    *   ***** ***   *     *        *     * ** ***** *** **   *     *** ********
74D   *****   * *  *  * **  *   **               ***** **         ***          ** * *    *       **         **  * ** ***
74F   * ****  *    * *****  *          ***       ***** ***  **** ****   *   *       *         *** *     * *  *     *
75B   *****     *  * *** * ****                   *  *  *          *            * *                                 **
76C
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      222222 22222 2222222 2222 222222 333 33333 33333 3333 3333 333333333 33333333 33333333 3333333333 333 444 44444444
      555555 66666 7777777 8888 999999 000 11111 22222 3333 4444 555555555 66666666 77777777 8888888888 999 000 11111111
MOS   ABCDEF ABCDE ABCDEFG ABCD ABCDEF ABC ABCDE ABCDE ABCD ABCD ABCDEFGHI ABCDEFGH ABCDEFGH ABCDEFGHIJ ABC ABC ABCDEFGH
76P   ***    ****  ****    ** *             *    *****                      *     *  *  *     **            *   *  ** *
76V          *                                                                      *                             **
76W   *                                           ****                              *  *                     *  * *
76X    **          * * *   ****                      *  *                        *                               *   *
76Y   ***    **    **** *  **** *      *         *****                              ** *   *                **  * *  *
82C   * *    *** * * ****  ****  *             * *** *   *       ***                ** *             *      *** ********
91B   ****** ** ** ******  ** * *       ** *     ***** **        *****     **** *   ******** ********** *** *** ********
93J   ***    ** ** *  * ** ***  *   *             ** * *                            ** *      *****  *  *   **  **** ***
94B   *  ***  *  * *  *  *          *             **                                ***  * * *    *   *      *        *
95B   ****** ***** ******* **** **  **           ***** ***       *****     ****** * ******** ********** *** *** ********
95C   ****** ***** **** ** ****     *            ***** *      *      *  *         * ******** *** ****** *** *** ********
96B    ** *  *  *  * * * * **** *    *            *  * *           *          * * *  **    *            *   **      *
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```
                                                                   1 11 11111111 11111 1111111 1111111111 11111111 111 111 1111
      111111111 2222222 333 444444 555555555 6666 7777 88888 99999 0 11 22222222 33333 4444444 5555555555 66666666 777 888 9999
MOS   ABCDEFGHI ABCDEFG ABC ABCDEF ABCDEFGHI ABCD ABCD ABCDE ABCDE A AB ABCDEFGH ABCDE ABCDEFG ABCDEFGHIJ ABCDEFGJ ABC ABC ABCD
000   ****** ** *** *** *** ****   * *  ***  **** ***  *  *  *  *  * ** **  ** * *     *  *    ** *        *    *  **
05B     * *  *    *   *     *                **                            *        *    *       *                    *
05C   * * *  *    *   *     *      *         **                            *        *    *     * *                    *   *
05G   * * ** *    *   * *** ****    * * **** **   *             *       ** *                 *      * *       *
11B   * ******* ***  ** ***  ***   *    * ** **** ***  *     **      ** ** *   *   **    * *** * ** *                  **
11C   ********* ***  ** *** ****   *** ***** **** ***  *  *  ***     ** ****   *   ****  * *** * ** *         ** ***   *** *
11H   * ******* **** ** *** *****  *** ***** **** **** *     ***     ** ** *   *   **  * * *** *  *         *  **      **
11M   * ******* *** *** ***  ***   * ** **** **** ***  **    *       ** **    **   **  * *  ** * ** *            *       **
12B   ** ** **   * *  * **   **    ** * * *  **   **   * *   *       **             *    *           *
13B   ********   ** *** **   ****  **   ** * ***  **                 ** *          *   * ** ** *  * *     *               *
13E   ********* ****  * *** ****   *    *  * **   ****       ** *    ** ** **      *  *  *  **   *****      ** ** *    **   *
13F   * ******   **   * ***        *      ** **   **         *       ** *  *   ****  *  *  *  **      * *   *             ***
15D   * *   **   *    *       *    *         **         *                 *         *     *       * *     *       *  *   *
15E   * **** *   **  ** *** ****   ***  **** **** ***                ** *        * *   **    *   *       *           *    *
16D   * **   *   **   *   *   *    *    *    ***        *            **            *  *           *     *
16E   * * *  *   **   *       *    ***  *    **         *                 *    *   *      *       * *     *
16H   * * ** *   **   * *    ***   **   **   **** **                 **       *   *    *  **     ** *            *       **
16P   ****** *  * * *** * *  **    ***  **** **   **        * *       * *              *           *           *  *      *
17B   ********* ***  ** *** ****   ********* **** ***  *  ** ** * * ** **** * * **  *  *    ** * **     *  **** **  *** **
17C   ** ****** ***  ** *** ****   **   **   **** ** * *      *      ** ****   **      * ** *  *****    *  *  * *   **
17K   * **** ** **  * * *** ****   ********* ** * **                 ** ** * * ** *    *       *  *     *     **     **
19D   ********* ***  ** *** ****   **** ** * **** ***   *    *       **  ****   ** *   ** **    *       *    *   *   **
19E   * **** **  ****** *** ***    ***  * ** **   *    *     *       ** *** *   *   *  *       **                * *
24C   ****** **  * * ** *** **** * ********* **** *  *     *    ** *     ** *    *             *      *  *           *
24H   * ******   *    * * ****     ******  * **** *    *               * *    *    *         * *  *     *  **   * *     *
26L   * *    *   **   *            *         **                              *       *  *      *        *   *   *          *
26Q   * *    *        *       *    *         **                              *          *  **      *     *                  *
27E   ****** **  ***  * *** ****   ********* **** **   *  *          ** * * **  **     * *  *  ***          *  ***   *   *
31J   ********   *** ** *** *****  ********* ****            **      ** *     *      *  *  *  *
31M   * *    *        *       *    *         **                              *          *        * *     *                  *
31N   ****** ** **   ** *   *** *  ** ****** ***  *                  ** * *  *  **     * *     **            ** *
31V   ********* *   *       ***    ********* ***    *       * **      * *      *     *         **                              *
32D   ********* *    *  *   **** * ****** ** ** *                     ** * *  * * **     *     *           *    *   **
32H   * ******* * *   * *   * **   ********* ** *  *         *        * *     *      *  *                      *   *   ***
33S   ****** **  * * ** **  *****  ********* **** ***  *****          *  *** * * ** **  *  **     *      **    * **   **  *
35K   ** *** **   *   * * *   *    ** * * ** **                      ** * *          *          *
36C   ****** *  **** ** **  ****   *** *** * **** *          *       *  **       *   *   *      **            *
36K   **     *    *   * **     *   *         **                       *            *
43E   **  ** *  * *** * **   ***             ** *                    ** ***          *          *
43M   * *             *       * *  *         **         *                 *        *   **         * * *   *
44B   * *    *    *   *       *    *         **                           *        *    *   ** * * *   *      *       *
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                                                                   1 11 11111111 11111 1111111 1111111111 11111111 111 111 1111
      111111111 2222222 333 444444 555555555 6666 7777 88888 99999 0 11 22222222 33333 4444444 5555555555 66666666 777 888 9999
MOS   ABCDEFGHI ABCDEFG ABC ABCDEF ABCDEFGHI ABCD ABCD ABCDE ABCDE A AB ABCDEFGH ABCDE ABCDEFG ABCDEFGHIJ ABCDEFGJ ABC ABC ABCD
44E   * *    *        *            *         **           *                *        **    *       * *          *       *   *
45B   ****** *   **** *     ** *   *    *  * ***   * * *   * **      ** * *   *  **    *        *
45K   * **** ** ******* *** ****   ********* ****  *                 **   *            * * *
52C   ****** ** *** *** *    ***   *** ***** ***   *   *             ** ***  *   **    * ** *               * ***  **
52D   * *******   * *** **  ****   *** ***** **     *    *           ** **       **  * ***                         **
54E   ********* ******* *** ****** ********* **** ***  * *   **    * ** **** **  ***   * *** * **      *   *    *  **
55B   *****  *  ******* *   *  *   ***  ***  ***       *     *       **  **    * ** *  *        *       *   *   *
55D   ****** ** ******* **  ****    ******** ** * ***  * *** ***   * **   *  **  **  * *     *      **      *   *
57E   *     **    *   *       *              **           *                *                    * * *   *
57H      ** **    *   *        *             **                       *  *       ***            *              **
61B   *      *        *       *    *         **                            *              *       *                    *
61C   *  *  **    * ***      ***   * *  **** **                       * * *  **     *    *
62B   * ** * *  *** *** **   ***   * ******  ***       *              * * *  *       * *  *  *                  *
62E   **** ****  ** *** **    ***  **** *  * ** *  *   *     *       ** *      * *     *        *            ** *
63G   ****** *  ******* *** *****  ********* ***  *          *       ** ***  *    *    *    *   **         *   **
63H   *     **    *   *       *    *         **           *                *        *           * * *   *      *       *
63N   ****** *   ****** **  ****   ********* **** **   *   * **      ** * *    * **  * * *     **              *
63W   * *    *    *   *       *    *         **           *                *        *     *       * *   *      *
64C   * ***  *    *** * **  ****    **  **** ***                     **  *             *       *
67G   ********    ***** *** *****  **   * ** **           *   *      ** *** *    **    *  *  *  *    *    *            *
67N   * ******  ******* *** ****   ***  **** ***  ***  *  ** *       **  ***     ** *     *                *    *
67T   ********    ***** ***  ****  *** ***** ***             *        * **** *   **  * *  *                ***     *
67U   * *   **    *   *       *    *         **           *                *        *     *       * *   *      *
67V   *********   ***** * *  ***   ** * * ** ****  *      *   *      ** * ** *   *  *  *  *       *            ***
67Y   ********  ******* *** ****   **  ***** **           *          ** * *** *  *  *  *          *        *    *
68B   ********* ******* *** *****  ********* **** ** *        *    * ** *** ** * **  * **    * **   *      **  *** **  *
68D   **** ***  ******* **  ***    ** ****** **     *      *          * *    **  *   * *  *  *  * * **    *     *
68F   * **** **       * *    **    *  *** * **        *              * *              * *  *   *                      *
68G   * *   **        *       *    *         **           *                *        *     *     * * *   *      *
68H   ********* ***** *  ** * ***  ** ****** **** **      *  *   * * ** **** **  ** *  *  *    ***      *
68J   ********* ******* *** ****** ********* ***  **      ** **      ** *****    *  *  *  * **    *                *
68M   ********* ******* *** ***    ********* **** ** *    ** **      ** ***  * * *     *  * **  * *    **   *
71D          *    *                           *                            *        *
71L  **** *  *    *   *     * **             **                        *** *    **  *     * *   * * *          *
71M   *      *        *     ****    *   **   ***                     *    *      *
71P   ** *****        *     ** ***           **           *  *       ** **             *  **   ** * *              *
71Q   *               *       *    *         **           *                *     *  *     *                    *    *
72E   * * *  *        *      *** * **   *    **                      *   *       *                *                    *
74D   *** *  *        * *   ****    *   *    **    *          *       *                *
74F   ** *** *                 *             *     *                 *  **    *                *            *          ***
75B          *    *            *                                           *        *
75C   **  ** *     **   *   ** *    *                                *   *   ***          *    *
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MOS	1A	1B	1C	1D	1E	1F	1G	1H	1I	2A	2B	2C	2D	2E	2F	2G	3A	3B	3C	4A	4B	4C	4D	4E	4F	5A	5B	5C	5D	5E	5F	5G	5H	5I
76P	*	*	*	*		*	*	*													*		*											
76V	*	*	*	*		*		*				*	*		*	*				*		*	*			*	*	*	*					
76W	*		*		*		*	*				*		*	*	*				*	*	*	*			*	*				*	*	*	*
76X								*																										
76Y	*	*			*			*								*				*		*	*											
82C	*	*	*	*	*	*	*	*	*	*	*	*			*	*	*	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	*
91B	*	*	*	*		*	*	*		*	*	*		*		*	*	*		*	*	*	*	*		*	*				*	*	*	*
93J	*	*	*	*	*	*	*	*	*		*	*				*	*		*	*	*	*	*		*	*	*			*	*			*
94B	*		*				*	*				*	*	*	*	*	*			*	*	*				*	*	*	*		*			
95B	*	*	*	*	*	*	*	*	*	*	*	*	*			*	*	*	*	*	*	*	*	*		*	*	*			*		*	*
95C	*	*	*	*	*	*		*			*	*	*			*	*	*	*	*	*	*	*				*	*			*	*	*	*
96B	*		*	*				*								*			*			*				*								

MOS	6A	6B	6C	6D	7A	7B	7C	7D	8A	8B	8C	8D	8E	9A	9B	9C	9D	9E	10A	11A	11B
76P																					
76V	*	*												*						*	
76W	*	*												*						*	
76X																					
76Y	*	*																		*	
82C	*	*	*	*		*	*	*	*			*	*	*	*	*	*	*		*	*
91B	*	*	*		*	*	*	*	*	*	*			*						*	*
93J	*	*	*		*							*	*	*						*	*
94B	*	*																			
95B	*	*	*	*	*	*	*		*					*	*					*	*
95C	*	*	*		*	*								*						*	*
96B	*	*																			

MOS	12A	12B	12C	12D	12E	12F	12G	12H	13A	13B	13C	13D	13E	14A	14B	14C	14D	14E	14F	14G	15A	15B	15C	15D	15E	15F	15G	15H	15I	15J	16A	16B	16C	16D	16E	16F	16G	16J	17A	17B	17C	18A	18B	18C	19A	19B	19C	19D
76P	*	*	*						*	*																						*																
76V	*			*			*		*					*							*																											
76W		*	*	*		*				*				*			*			*								*				*				*												
76X				*								*																														*						
76Y		*	*																																													
82C	*	*	*	*	*	*	*	*	*	*			*	*			*				*	*	*	*					*	*		*			*		*	*	*	*				*	*	*	*	*
91B					*	*			*					*	*	*				*	*											*		*			*		*	*								
93J	*			*			*		*			*		*			*				*	*		*		*				*		*		*					*									
94B									*	*				*												*									*	*	*											
95B	*							*	*					*			*	*			*	*		*			*												*									
95C	*	*						*	*					*			*	*																					*									
96B				*					*			*								*				*						*									*			*						

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                                                                   1 11 11111111 11111 1111111 1111111111 11111111 111 111 1111
      111111111 2222222 333 444444 555555555 6666 7777 88888 99999 0 11 22222222 33333 4444444 5555555555 66666666 777 888 9999
MOS   ABCDEFGHI ABCDEFG ABC ABCDEF ABCDEFGHI ABCD ABCD ABCDE ABCDE A AB ABCDEFGH ABCDE ABCDEFG ABCDEFGHIJ ABCDEFGJ ABC ABC ABCD
000   *   ** *   *    * * * * *            * **   ***  *        *    ** *              *       *
05B   *               *       *    *         **                                     *     **      *
05C   *      *        *       *    *         **                                     *             *
05G   * ***  *   **   * **  *****            **    *   *             ** *  *                   *  *                 *  **       *
11B   ********* **** ** *** ****   **** **** **** **   ** *  *       ** ** *      **  * *     *  *          *    *   **
11C   *********  **  ** *** *  *   * * ** ** **** *    *      * *     ** **       **  * *     * ** *        **  *    **  *
11H   *********  *** ** *** ***    *** ***** ***  * *  *   *  *       ** ** *     **  * *     *             *    *   **
11M   ********* **** ** *** *****  **** **** **** ***  ** *  ** *    ** ** *   * **  * * **  * **    *      *    *   **
12B   *      *  ***   *  **   *    *         ** * * *   ** * *  ** * ** ***  * * **    *    *   *   *  *   *** ***         *
13B   ** **  *  **** ** *** * **   *** **  * **** **   *     *       ** **    *  *     *  *  *       *      *      *
13E   ********* **** ** * * *** *  ***  ** * **** ** * **     ** *     * ***** ** ****  *       * **       ***** * **        *
13F   *      *    *   *       **   *         **                      **                *        *
15D   ** *** *   ***  * ***   ***  *** * ** ** * **   * *      *       ** **     *  *   * *  **    * * *   *          **
15E   * **** *   ** *** ***  ****  *** ***** ***  ***                  ** *          *    *  *                         *
16D   *  **  *    *      *    ***  ***  **   **                        **  *       *
16E   * ***  *   **      *    ***  ***  **   **                        **  * *            *        *                   *
16H   * ***  *    *      * * * ****  ***  * ** ****       *                  *                                    *    *   *
16P   *                *             *         **                                         *
17B   *   *  *   *       * *     *       * *  * ** *                                  *   * *
17C   ********* ******* ***  ***   *  *****  **    ***          **        *  ***      ** **              **     *   *   *    **    * ****
17K   ***  ***   *  * *   *  * *   **   **** ** *  *                 *      ***       *       ****      *          **
19D   ********* **** ** *** *****  **** **** **** ** * * *   * *     ** ****      **    *  *  * ** *    *         *   *
19E   * *******  **  ** **   ***   **** * ** ***  *           *  *  * ** *          *   * *       * *                  **
24C   * **** **  * **** * *  ***   ****** ** **     *          ** *     * ****          *                *       *  *
24H   ***    *   *    *   *                 * ** *      *               *                * *  *   *       *
26L         *                                                                 *        *
26Q   *      *        *       *    *         **          *                    *        *     *       *                    *
27E   *  * *      *   *        *   *   **    **                                        *
31J   * ** ***  ***** *   * ** *   ********* ****            *       ** **      *     *                    *
31M   *      *        *       *    *
31N   * *  * **       *     * **** ** ****** **                      ** *    *   *                          ****
31V   ***  * *        *     ****    ** ** ** **                       *                *
32D   * ** ** *           *    *    ** ******   *                    ** * **                                         *
32H   ****** ** ***     * *** * **** ********* **** ***      *  **      ** **    *   **     *  *  * **       **          **  *
33S   * *******       *   *   *     ** ***** **** * *     *          *     *   * *   *     *        *       **        *  ***
35K   ****** **   **  * ***  ***   **** **** **                      ** **    *          *   *    *            *
36C   * **** *  ***  **  *  * **   **   ** * ***  *          *           *     *  **    *        *                 *
36K   **  *  *    *   * *    ***  * ** *  ** ** * *          *       **    *         * *  **   ** *
43E   *   *  *   ***  *        *               **                    **                *
43M   *     **        *       *               *                          *                      *
44B   *  **  *    *                   *  ***   *    **                          *
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MOS BASELINE SKILLS PROJECT
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                                                                   1 11 11111111 11111 1111111 1111111111 11111111 111 111 1111
      111111111 2222222 333 444444 555555555 6666 7777 88888 99999 0 11 22222222 33333 4444444 5555555555 66666666 777 888 9999
MOS   ABCDEFGHI ABCDEFG ABC ABCDEF ABCDEFGHI ABCD ABCD ABCDE ABCDE A AB ABCDEFGH ABCDE ABCDEFG ABCDEFGHIJ ABCDEFGJ ABC ABC ABCD
44E   * *    *                     *                                       *                      * *   *              *
45B   * *  * *            * *  *             **    **         *      *  *        *     *
45K   * *  * *    *   *  *    *     *   *** **                    * ** *              *       *                *
52C   ********* ******* *   ****   ********* ***  ** * *             ** ***      ***   * ** **             *   **  **
52D   * **** **  **  ** ***  ***   *** ***** **   ***  *   *         ** ***      **    * *  *                  **
54E   ****** ** *** *** *** ****** **   *  * **** **** *       *     ** **   *** **    *  *    ** **    *  * *     **
55B   *               *     *                ***                         * *      * *                   *          *
55D   *      *        *            * *    *  **              *        * *    *                                  *
57E
57H   * * * **    **  *   *   **   * *  **   **                      **           *    *        *
61B   *      *        *            *     *   **           *                * *        **            *      *      *    *  **
61C   *      *    * ***       **   ********* **                       *      *
62B   ********  ******* *** **** * *** ***** ****            * *     ** ***  *   ***   * **  * **** *
62E          *    *   *  *    *              **     *                **                      *
63G   * *    *       **      * **   **   ***  **                       * *
63H   * *   **    *   *       *    *         **           *                *        *     *     * * *      *   *
63N   ****** *   ** *** **   ***   *** ***** ****            *       ** *      *       *        *               *
63W   * *    *    *   *            *         **           *                *        *     *       *
64C   *  *  *       * *     ** *                                         *             *
67G   * *    *    * *** *   *****  **   * *  ***                     **  *   *   *     *    *
67N       *  *    * *** *    ***   *    *  * **        *              *                                         *
67T          *      * *        **   *     *  **                                           *
67U   * *   **    *   *       *    *         **           *                *   *    *     *       * *   *      *
67V   * * *  *    * * * *   ****   *     **  **              *       **                *                        *   *
67Y   * *******   *** * **   ***   **   *    **                      **   ***                   * *
68B   **** * *  ******* **   ***   ** ***  * ***    *              * **   *  * *  *    *     *  *    *          **  *  *
68D   ********  * *  ** **         *    *  * **            *         ** * *  *         *  *    *    *           *
68F   * ** ****       * *     *    *   ** *  **                      ** ** *   *       *  *                   * *
68G   * *   **    *   *       *    *         **           *                *        *     *       * *      *           *
68H   **** * ** ******* *   *****  ** ****** **** *                * ** ***  **  **    * **     **      *      *
68J   *  * * *        * *     *    ***  **   **    *                  *                *  *   *
68M   ***  * ** * *  * ***  *      * *  ** * ***  **                 **                *  *   *
71D   *      *                *                                          * *        *                      *
71L       *  *               ** *   *        **                                        *        *               *
71M   *      *    *   *     * **             **                         **      * *
71P   ****** *   **   * *** ** * *         * **   **      *  *       ** *  **              *    *  *           *    **
71Q
72E   *** *  *       ** *** ****** *    *  * ***                        ***   * **  *    *                *
74D   **        *     *     ****             **                         *      *
74F   **  *  *                * *            *
75B   *      *                **             **                            *           *  **
76C
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                                                                   1 11 11111111 11111 1111111 1111111111 11111111 111 111 1111
      111111111 2222222 333 444444 555555555 6666 7777 88888 99999 0 11 22222222 33333 4444444 5555555555 66666666 777 888 9999
MOS   ABCDEFGHI ABCDEFG ABC ABCDEF ABCDEFGHI ABCD ABCD ABCDE ABCDE A AB ABCDEFGH ABCDE ABCDEFG ABCDEFGHIJ ABCDEFGJ ABC ABC ABCD
76P   ** *   *               * *             **                         **
76V               **  *       *    *         *               *       *            *    *
76W    *   *     **   *      ***         *   *                           **       *                            **
76X                                                                          *     *  *                                  *
76Y   **     *  ***   *        *             **                          **      **                   *
82C   * ******* *** *** *** ****** ****** ** **** **** *   * ****    ** ******   *****  *                  **** ** *** *   ****
91B   **** ***   ****** **  *****  * *  **** ***  ***  * * *          * *** ***  **    ******  *             *  **
93J   ********   **   * *** **** * ***  * ** **   **         ***     ** *    *      *  *  **    * *                          *
94B     *    *   **** *       *        ***   **    *   * *   *     *        *                         * *       *
95B   ********* ****  * *** *****  **** **   **** ***  *** * *       ** ***  * * **    *  *  * **            ****  **
95C   ********        * * * ****   *    **   **    *   * * * *       ** ****     **    *        *
96B     **   *        *   *                  **           *                *                      *     *
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APPENDIX B

Excerpts from

Scientific and Technical Report
BSEP I & BSEP II Curricula Model Analysis,
CDRL Sequence No. A008 of Contract DABT60-81-C-0017
by RCA Service Company dated 16 May 1983.

See RCA's complete report for figures and appendices.

Format of Report

The report contains the following sections: Rationale of Approach, Major Curricula Model Questions, Utilization of Clustering Results, Module Configuration, Module Description, and Utilization of MOS Baseline Skills Profile.

Rationale of Approach

The rationale of approach to curricula model development is derived from three sets of assumptions: guiding learning principles, target population characteristics, and program operational principles.

Learning principles can be gleaned from many reputable sources. Such an effort requires that information be synthesized for utilization in any given situation. Following the synthesis, the statements can be used as guiding principles. The principles listed below have been selected to guide this present effort in curricula model development.

1. Learning is an internal, idiosyncratic process, the occurrence of which an observer cannot know. An observer can know the results of learning only by observing the performance of the learner or by examining a product produced by the learner. A consequence of this learning principle is the realization that curricula models should stress performance. Just as learning is idiosyncratic, so are observable approaches (learning styles) to learning. Based on this principle, it follows that curricula models should accommodate individual styles and rates of learning.

2. An often debated topic is whether learning is an incremental process or an all-or-none process. Despite this continuing debate, it appears that many skills are learned and maintained through practice. It is also possible to identify successive approximations for most learning situations, and most people are quick to judge the differences between proficient performance and unsuccessful performance. Basing curricula models on these learning principles means allowing for practice, both of vital parts and of the total of the performance desired. Also, spaced and massed practice should be allowed for in the curricula models.

3. Certain types of learning appear to be incidental, other types appear to be goal-oriented, and still other types appear to be based on knowledge of results. Therefore, the curricula models will allow for learning in context, providing a statement of an identifiable goal, and providing for feedback.

BSEP I and BSEP II programs must be designed and developed so as to be instructionally relevant for the proposed target populations. Popular press accounts to the contrary, the entrants into the U.S. Army (potentially the recipients of BSEP I training) present a very heterogeneous group. However, this group is truncated as soldiers leave the Army for various reasons; thus those receiving BSEP II training will be more a homogeneous group than those receiving BSEP I training. Although the target population may be quite heterogeneous in some respects, several quite reliable characteristics prevail throughout it. The following characteristics were considered during curricula model development activities.

1. A basic skills repertoire and learning history that has certain "holes." In other words deficiencies may tend to be concentrated in specific areas, strengths and weaknesses in basic skill performance (prerequisite competency mastery) may be individualistic, rather than being generally dispersed across many skill areas.

2. A learning style that is often characterized as lack of motivation, but which could more accurately be described as a low tolerance for frustration. In many instances the low tolerance for frustration is coupled with behavioral patterns of nondisruptive resistance to traditional learning approaches.

3. A tendency to prefer active learning situations or at least situations that provide many opportunities for success. Associated with this tendency is a tendency to respond more readily to very concrete, external signs of approval for both performance and personal effort than to other kinds of approval.

In curricula model development it is appropriate to gain insight into principles which may guide future program operations. These principles can then be considered in developing the models. At least the following program operational principles apply to the current effort.

1. Content-valid instruction. Content validity is described in terms of prerequisite competencies.

2. Criterion-referenced instruction. Again, the prerequisite competency statement is the criterion referent.

3. Mastery learning. In this case a performance standard is established and adhered to as training outcome.

4. Functional approach to basic educational skills preparation. This approach has two implications. First, an individual student must receive remediation in only those prerequisite competencies needed for entry into and progress through IET, unit training program, and 20-level soldier's manual tasks. Second, strong evidence of face validity must exist for the content of an instructional module and the MOS to which it is associated.

Major Curricula Model Questions

Early in the process of curricula model development it appeared desirable to formulate major questions which were to be answered as part of the process. Once the questions were formulated, then a systematic approach to development could be initiated. Following is a list of the major curricula model questions that were developed.

1. What is the potential program content that the curricula models should address?

2. How could MOS clustering results be used?

3. How should the remediation content be divided into curricula modules? What are the modules?

4. How should the curricula modules be arranged into a "course map?" Instructional sequence?

5. How should lessons be derived for modules?

6. Is more than one version of each module necessary to accommodate factors such as MOS context, level of difficulty of presenting stimuli, diversity of prerequisite competency statement?

7. How should (if at all) frequency counts for prerequisite competencies impact curricula?

8. If clustering results are used, what approaches can be taken to insure that each MOS has access to only the modules supported by analysis data? What is the consequence of having access to more than needed or less than needed?

9. If the same prerequisite competency has been identified for BSEP I and BSEP II, should there be differences in the curricula to accommodate this situation?

Utilization of Clustering Results

The subject contract, and subsequent decisions made using project operation, made it clear that prerequisite competencies were the content areas the curricula models were to address. Once the elaborated taxonomy was developed (See the Operational Summary Report, CDRL Sequence No. A004, for a more extensive discussion on taxonomy development.), the outside parameters and many of the process variables for curricula model development were established. Attention then turned to utilization of clustering results in the curriculum model development process. Several "test" clustering solutions were processed using Statistical Analysis Systems (SAS) methodology. Comparisons were also made with CODAP clustering solutions. (See the Clustering Report, CDRL Sequence No. A006, for a more extensive discussion on clustering.) An attempt was made to answer major curricula model questions (see previous section, same title) through use of clustering results. The following results were obtained (entries are arranged to coincide, numerically, with the questions listed in the previous section):

1. The basic unit of data entered into the clustering solution is percentage of frequency of occurrence of prerequisite competencies on an MOS-by-MOS basis. The basic data for curricula model development are the prerequisite competency statements.

2. This is the question under discussion.

3. Since MOS are clustered, and not prerequisite competencies, the clustering solution did not help answer this set of questions. The only condition under which clustering results may assist to answer this set of questions is if certain a priori assumptions, such as develop similar modules for combat arm MOS, were made. No such a priori assumptions appear defensible.

4. Best data for "course map" construction and instructional sequencing can be gained from extended task analysis results and through inspection of entries on the taxonomy. The clustering solution offers no additional information, or as a minimum, adds no efficiencies to this decision-making process.

5. See #3 above. The clustering solution did not provide detail to help answer this question.

6. The clustering solution provides clues to help answer this question. However, a more complete and efficient answer can be gained by examination of lists of prerequisite competency indicator statements and an MOS by prerequisite competency by BSEP level matrix.

7. As stated in the Clustering Report, frequency counts do affect the clustering solution - that is, a different solution can be obtained using nominal scaling. However, frequency counts are, in part, tied to considerations of homogeneity and heterogeneity of prerequisite competency indicator statements and these considerations are important for curricula model development. Again, the clustering report did not help answer this question.

8. This appeared to be the most often asked question. Restated it appears as though the question is as follows: Does clustering group any MOS together so that all MOS that have certain prerequisite competencies are clustered together? The answer is "yes" for a very restricted number of prerequisite competencies. However, the clustering solution offers little guidance as to how to treat prerequisite competencies that appear in more than one cluster--most dramatically prerequisite competencies that appear in all clusters.

9. This question is best answered through inspection of prerequisite competency indicator statements lists and via a policy statement, not from clustering results.

Based on the considerations noted above, it was concluded that the clustering solution did not have practical application in the developing curricula models. Prior notification (as shown at Attachment B) was given of this conclusion.

Module Configuration

Based on the conclusion noted above, that the clustering solution could not provide a defensible and informed basis for curricula model development, attention was turned to several other data sources. The first data source reviewed was an MOS by prerequisite competency by BSEP level matrix. Nominal scaling--occurrence or nonoccurrence of prerequisite competency--was used on the matrix. Review of the matrix (the working copy is shown at Attachment C) showed complete coverage of all prerequisite competencies at both the BSEP I and BSEP II levels. Since replicate analysis results and subtasks were not included in the matrix, and since their inclusion could be assumed to only add to the coverage, it was tentatively decided that a single module configuration would be defensible for both BSEP I and BSEP II levels.

Since there was extensive coverage of prerequisite competencies at both BSEP I and BSEP II levels, it appeared logical to examine whether an existing structure would suffice to identify modules and sequences. The most germane structure was presented by the statements, major categories, and subcategories on the taxonomy. Based on a review of this structure, with full cognizance of its origin in the field analysis and test development efforts, the following conclusions were reached:

1. Headings for major categories could be defensible as module titles. However, there was a concern as to length of instruction being quite variable on a module-by-module basis if major headings were used in this manner. Consequently, it was decided to group on other than major categories, but to maintain the integrity of these headings in as many cases as possible.

2. Subcategories, represented by the prerequisite competencies, were quite heterogeneous and could not stand as coherent and consistent instructional elements. It was decided to group or divide the subcategories into concrete and more homogeneous instructional elements.

3. While a general, simple to complex arrangement was prevalent within many major categories, others were not arranged in this manner. Also, only limited clues as to sequencing was gained for major categories. It appeared appropriate to seek additional sources of sequencing information.

Following the recombination of taxonomy subcategories, via grouping or division, a review of prerequisite competency indicator statement lists and extended analysis results, for reading and reading-related skills, was made. Based on these reviews tentative modules were identified and sequenced. The tentative modules were then reviewed and revisions made to show independent, dependent, and codependent module relationships.

Figures 1 and 2 present the derived module configurations for the BSEP I and BSEP II curricula models. The following information helps describe the graphic presentations:

1. Figure 1 presents modules for the verbal/written prerequisite competencies in categories 25 through 41 on the taxonomy.

2. Figure 2 presents modules for the numerical prerequisite competencies in categories 1 through 19 on the taxonomy.

3. Progression begins at any point labeled "Entry" and proceeds upward through Levels A, B, and C.

4. Levels A, B, and C are arbitrary distinctions that roughly equate to difficulty or to modules that require a larger number or prerequisite.

5. The taxonomy numbering system is maintained and can be used as a general guide to module contents. A list of module titles is at Attachment D.

6. Descriptions for the modules, of various types, are provided in the next section.

7. A discussion of how these figures can be used in conjunction with program operations and profiles is provided in the section entitled "Utilization of MOS Baseline Skills Profiles".

Module Description

The modules depicted in Figures 1 and 2 require descriptions from the following vantage points:

1. General descriptions that illuminate what the module structure is, i.e., what do the codes and title denote.

2. Context descriptions as related to a curriculum development process. (See Curriculum Design Specifications, CDRL Sequence No. A009, for examples of base and iterative modules as described below.)

3. Levels of difficulty as related to presenting written stimuli.

4. Functional designations as related to task and subtask performance within MOS.

General Descriptions. Figures 1 and 2 show four basic types of modules: formed as "stand alones" for individual prerequisite competency statements; formed by combining two or more individual prerequisite competency statements; formed by combining at least two prerequisite competency statements and by using at least one prerequisite competency to establish context; formed by combining prerequisite competencies from more than one major category on the taxonomy or by dividing and individual prerequisite competency into parts. A listing of the modules by type is at Attachment E. Separate descriptions of each type is at Attachment E. Separate descriptions of each type are provided below.

1. "Stand-alone" modules represent a coherent instructional element that need not be combined with other prerequisite competencies. Any diversity or heterogeneity, either topical, sequential, or level of difficulty, is

recommended to be handled by designating different lessons in the modules. Several series of modules (12a, 12b, 12c, 12d, 12h, 13a, 13d, 13e, 16a, 16e, 16g, 16h, 18a, 18b, 18c, 19a, 19b, 19c, 19d) represent this organizing principle across a common group of prerequisite competencies. Other modules of this type represent selected skills which can readily "stand alone" for instructional purposes.

2. Modules formed by combining two or more prerequisite competencies represent content that can efficiently be combined for instructional purposes. The efficiencies may be based on the amount of instruction necessary for individual prerequisite competencies or the structure (lesson sequence) that can be created by developing prerequisite competencies. An example of the former is module 4a, b and an example of the latter is module 14b, c.

3. Modules formed by combining two or more prerequisite competencies and using one prerequisite competency to establish context are very much like the modules described above. In most cases the context established is of the following type: one prerequisite competency is being addressed, such as 5c, 5d, or 5e, and one or more prerequisite competencies are included to "round-out" the context (in this case 5, a, f, b).

4. The final type of module was developed by consideration of special circumstances. In one case (6a, b, 11b; 6a, c, 11b; and 15a, b, c, 11a) terminology prerequisite competencies were combined with others so that terminology can be instructed in a more meaningful way. Such is also the case with vocabulary and codes and symbols (25a, b, 26a, d, 41h and 25c, 26a, d, 41h), even though in this case an option is left to only instruct vocabulary and codes and symbols (26a, d, 41h). In one instance, module 3a (Temp), a prerequisite competency was divided because temperature was too discrepant from other degree measures.

Context Descriptions. As noted previously, a major curricula question is whether more than one version of a module is necessary to accommodate the factor of MOS context. To answer this question in an unequivocal manner requires data that go beyond the parameters of the present effort. However, based on considerations of acceptability and usability for curricula products that may result from subsequent work, a strong case can be made for recommending more than one version of some modules. Such a case is based on the realization that considerable heterogeneity exists in most prerequisite competency indicator statement lists for the various MOS. This heterogeneity reflects, in part, the comprehensive nature of the prerequisite competencies. Perhaps more strongly, it also reflects the diverse conditions under which prerequisite skills are applied. The case is also strengthened when a review is made of the number of MOS to which various prerequisite competencies apply. The information at Attachment C provides an indication of such coverage across MOS. A final factor that also must be considered is in the area of evaluation of any subsequent program operations. It can be postulated that data from such evaluations would be more directly interpreted if the context of the modules of instruction were MOS-related.

Based on the considerations noted above, it is recommended that more than one version of some modules be developed. The recommended modules are listed at Attachment F. (Specific MOS or CMF recommendations are contained in the Curriculum Design Specifications, CDRL Sequence No. A009.)

Presenting Stimuli Description. Curricula modules can be developed as more or less difficult for the student depending on the difficulty level of presenting written stimuli. How to cope with difficulty level of presenting written stimuli is dependent upon the relationship of written stimuli to the instructional content of a prerequisite competency. In one case the written word may be a mere vehicle to express content and directions to the student. Module 2.d,b,g would be an example of this case. Difficulty level of written material is best handled under these circumstances, by adhering to a policy statement by which it is prescribed. In a second, and most important case, the written word is an integral part of the instructional content of the module. Module 27e,f is an example. In this second case the question of difficulty level of written materials is considerably more complex. For example, one position might be that the difficulty level should coincide with samples selected from on-the-job situations. This position assumes that all job-holders should read or be remediated to read at the level of written material presented on the job. There is currently no policy statement to this effect and it appears that such a policy statement will not be forthcoming in the near future. Another position might be to prescribe a level of difficulty and then match that level in all modules. This position seems inadequate to address real diversities across MOS.

In view of the discussion above, it is recommended that various modules should be developed at at least two levels of difficulty for presenting written stimuli. It is further recommended that one level be a minimally prescribed level and the other be near the level(s) of difficulty present in on-the-job materials. A listing of modules covered by this recommendation is at Attachment G.

Functional Designation Descriptions. A strength of the data generated on the MOS Baseline Skills Project is that it provides empirical results to demonstrate the functional nature of prerequisite competencies, i.e., the competencies are directly tied to portions of task analysis results. The present curricula models can also be strengthened through identification of the functional tiein between various modules and task performance. Initially it was considered desirable to express module sequences in terms of these functional tieins. However, such an approach did not allow for complete expansion to cover all prerequisite competencies. At Attachment H is a listing of Modules that demonstrate a strong functional tie to task performance. The relevance of this information is discussed in the next section on utilization of MOS Baseline Skills Profiles.

Utilization of MOS Baseline Skills Profiles

To fully discuss the utilization of MOS Baseline Skills Profiles in conjunction with the curricula model several assumptions have been made concerning subsequent development and operations beyond the effort in the subject contract. The assumptions are as follows:

1. Curricula development will be accomplished in accordance with this model or some approved variation.

2. Curriculum Design Specifications (CDRL Sequence No. A009), or some approved variation, will be used during module lesson development.

3. At least the following types of curricula/program materials will be developed: instructional; student learning guide; instructor; and learning center coordinator (course manager).

4. The curricula models will be part of the learning center coordinator (course manager) materials.

5. MOS Baseline Skills Profiles will be augmented to reflect any of the following as applicable: selection and criticality reviews conducted by TRADOC review groups; results obtained from the validation of diagnostic tests (See Modification P00006 to subject contract.); and resolution of any incongruities between data gained from task analysis and data used as input during test development.

6. Cut-scores will be established for diagnostic tests (CDRL Sequence No. A007).

7. Both locator and diagnostic subtests will be used as part of any program.

Based on the above assumption, utilization of MOS Baseline Skills Profiles would proceed in the following manner during program operations (from the perspective of student flow/progress):

1. Locator test administered and scored.

2. Based on locator test results, selected diagnostic subtests administered and scored.

3. Comparison made between test results and profile requirements. (This process requires a conversion between coding systems used in development to date. At Attachment I is a table that assists with the conversion.)

4. Comparison of profile requirements with module configuration.

5. Initiation of student progress indicator record. (Recommended samples are at Attachment J.) At least the following actions would be required, providing individualized instruction was proceeding on an MOS-by-MOS basis:

a. Enter identifying student information.
b. Enter locator raw scores.
c. Enter code diagnostic subtest results (depending on form used).
d. Enter or code modules to be completed (depending on form used).
e. Enter or code lessons exempted in a module (depending on form used).
f. Enter or code any required information in "Additional Modules" section of the form (depending on form used).

6. Compile information on form as instruction progresses.

Because the explanation above is in terms of the recommended sample forms at Attachment J the following elaborations are provided.

1. As part of the curriculum development effort a decision must be made as to the type and format of student progress indicator record to be used. If the open (not MOS specific) form is used centralized printing and distribution can be accomplished. This form will also require more effort to be completed for each student. If the MOS-specific form is used then coding can be accomplished and time saved for each student. However, all decisions about lessons exempted and additional modules must then be made as part of the development process, prior to printing the form.

2. The "Lessons Exempted" portion of the form arises from the special nature of some modules. As an example, module 33b,a has lessons for note-taking involving verbal communications, written materials, and observation of performance. A particular MOS may require any one, any two, or all three types of settings for note-taking. The curriculum development process will account for these differences and information will be available to program operators for specific MOS.

3. The "Additional Modules" portion of the form results from a project specific situation based on empirical results of analysis when compared with the design-oriented information in the module configurations. Specifically, it is not possible (on less than an MOS-by-MOS basis) to configure modules so that only the relationships apparent in the analysis results are present in an instructional sequence. In other words, Figures 1 and 2 may show dependent (prerequisite) relationships not shown for an individual MOS. In these cases a decision is necessary as to how many, if any, additional modules may be prescribed to fill out an instructional sequence. It is recommended that this issue be pursued through the utilization of small study groups at the time of program implementation.