DEVELOPMENT AND EVALUATION OF A UNIT OF A RETRIEVAL-LANGUAGE COURSE

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ABSTRACT

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DEVELOPMENT AND EVALUATION OF A UNIT OF A RETRIEVAL-LANGUAGE COURSE

This thesis-equivalent is based on the steps taken and the problems encountered in the development, production, and evaluation of a course on the MARK IV computer retrieval language aimed primarily at non-data processing specialists working in user departments at Canadian Pacific Limited in Montreal, where the author is responsible for user education in the information systems area.

An existing but ineffective audiovisual self-instruction course was improved by resequencing the content and adding hands-on problems and a fifteen minute slide/tape introduction.

Twenty-eight students were divided into three treatment groups in an attempt to assess the effectiveness of the new introduction. KR_{21} reliability computed on the criterion test for the new introduction was .70. Even though analysis of variance revealed no significant differences ($p < .05$) between the mean scores of the three groups on this test, the project was thought to be a success in terms of increased motivation and the enhancement of trainee skills.

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and all those who, voluntarily or not, participated as students during the various stages of revising and re-revising of the MARK IV Course for Users.

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CHAPTER ONE

Introduction

This thesis-equivalent documents the problems encountered in the development, production, and evaluation of a real course currently in heavy use in a large company.

The format of this write-up is based on Tracey's (1971) Training Development System model. (See Figure 1.) Since the basic distinction between a thesis-equivalent and a thesis is that the thesis-equivalent demonstrates production, evaluation, and revision competence while the thesis demonstrates research capability, it seems appropriate to follow a Development System model for the thesis-equivalent. Other models, such as Silvern's (1971) and Friesen's (1973) were considered, but Tracey's was chosen because of its clarity and coherence.

The actual development project was constrained to a fifteen-minute Caramate slide/tape presentation and hands-on problems, the whole to be implemented within four months from the start date. Consequently, it was not possible to fully follow any formal model for this development work. (Details of the constraints are mentioned in the appropriate sections.) Nevertheless, in writing up this work, it appeared that the greatest value would be realized by writing it up using Tracey's model as a basis for discussion.

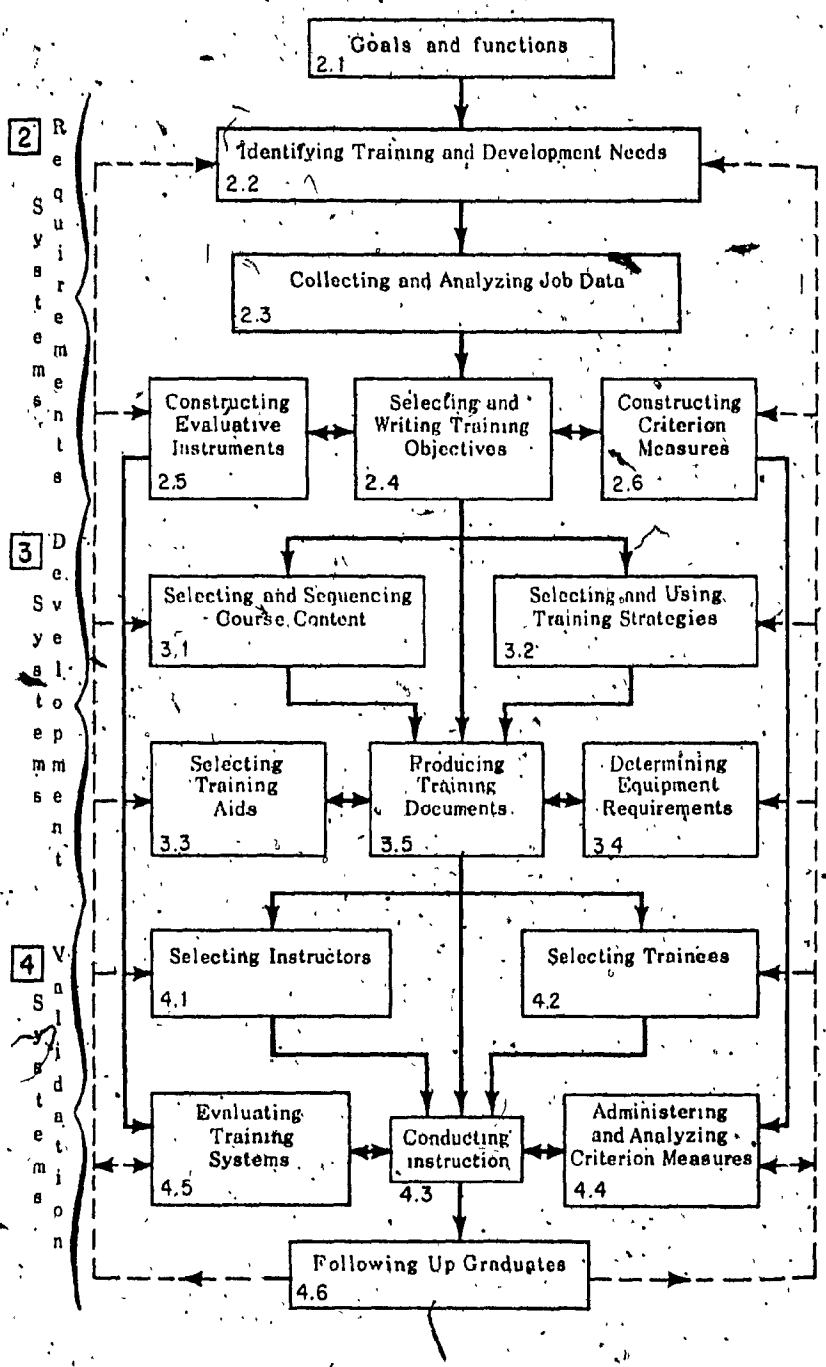

Figure 1. Flow-chart model of a fifteen-step training and development system. (Tracey, 1971, p.6) (Section numbers added.)

The company is Canadian Pacific Limited (CP) in Montreal. The users of the course are CP employees engaged in a variety of jobs in a variety of departments, with a corresponding variety of backgrounds, interests, aptitudes, and motivations. The subject matter of the course is the MARK IV computer retrieval language.

A person who uses the output from computer programs but is not himself a data processing specialist is called a "user". Users at CP come from departments such as Marketing and Sales, Transportation, Stores, Administration, and others. When a user discovers (or creates) a need for certain computer output, he can request, through proper channels, that the Information Systems department write programs to achieve the desired results - a time-consuming and costly method. Or, if the processing logic involved is simple, a user can write his own request programs -- if he knows a suitable retrieval language.

A retrieval language is simple to code and is close to English syntax. It provides basic arithmetic and logical operations, and produces formatted, analytical reports with a minimum of programming mechanics. Appendix A describes MARK IV (Markus, 1976) the retrieval language currently used by users at CP.

Until January, 1975, few enough people required instruction in MARK IV that a very low priority was assigned to improving the quality of the ineffective self-instruction course then in use. A sudden sharp increase in the number of requests for this course since then made its revision much more urgent. A project was initiated at CP in March of 1975 to revise, modify, rewrite, or otherwise improve the quality of MARK IV instruction, especially for user personnel. (Information Systems personnel, it was reasoned, could learn what they needed to about MARK IV (to them an easy second or third language) through whatever instructional method was available, so no additional effort would be required to meet their needs.)

The author is employed as a Course Advisor in the Information Systems Education Centre at CP, and MARK IV instruction is one of her primary areas of responsibility, Therefore, it fell to her to plan, produce, administer, and evaluate the new (and hopefully improved) MARK IV course. Professional assistance with artwork, photography, and other audio-visual materials was available for this project on the same basis as for other company projects of a similar nature.

And since this project was the kind of work which is acceptable as a thesis-equivalent, it was proposed and accepted as such.

Need.

Users who were trained on the old course could not write retrieval programs at all, after the course alone. It took one man-week of instruction on the old course, and an additional man-week of being tutored to train an person using the old method.

The cost of training without improving the course, then, was two man-weeks per person times the number of students. About a hundred students were expected to require training in 1975; therefore, the cost of not developing a better course would have been two hundred man-weeks.

Since the cost of developing training being approximately twelve man-weeks of the author's time versus the one hundred extra man-weeks of users' time (being tutored after the course) the course was judged to be worth developing.

The actual materials costs and equipment costs were very small, compared to overhead costs. Table 2 on page 59 gives the actual costing information for the project.

This project was the first of its kind done by the Education Centre at CP. There were no company standards to follow, such as those used at other companies (eg. Bell Canada) and standards used by other companies were not available to the author except in a general, non-specific way.

It was imperative that <u>something</u> be done about the course in question, but the author was given complete freedom to do whatever she thought best- with the following limiting and sometimes contradictory constraints:

1) It was not possible to simply purchase a better course, as the only self-instruction course on the market was the one already in use.

2) The author had a maximum of four calendar months (not man-months) to complete the project, during which time she was expected to fulfill other responsibilities as well. Much of the work on this project was accomplished after office hours.

3) The author was not given any budget restrictions, but was not given any budget, either. She was told to "keep the cost to a minimum", and was not allowed to employ outside help, such as the services of a professional audio-visual consultant.

4) Company policy forbade the circulation of unneccessary paper- and this includes things like questionnaires. This policy severely restricted the amount of pre and post testing that could be done.

5) The author was on one hand told to do "whatever she thought best" (given the constraints of time and budget), and on the other hand, told explicitly to use the Caramate machine in the project, and to add hands-on problems to the course. Suggestions by the author to use other media or methods of presentation were met with resistance.

The previously-decided upon method of repairing the old course involved rewriting the Introductory chapter as a slide/tape presentation, and adding several hands-on problems to the course. It seemed, then, that the only real choices open to the author concerned the wording of the script for the slide show, the content of the accompanying slides, and the number, type, and content of the hands-on problems to be added.

Tracey's model was used as a checklist to lend some semblance of a systematic approach to what could have been a very haphazard project. The model was not followed exactly, due to the constraints mentioned above and those discussed in later chapters. The resulting course had some limitations, but the author satisficed, given the constraints, lack of precedent, and lack of standards.

Since this project consisted of systems analysis, instructional design, evaluation design, and data reduction, it seemed a proper starting point to enumerate the basic principles of these areas.

The major principles of systems analysis, as applied to training, are:

1) Formulate a clear and unequivocal definition and specification of the system under consideration to include the need for the system and the delimitation of its boundaries.

2) Develop lucid and functional descriptions of the components of the system and the ways in which they interact.

3) Determine and define the system objectives in terms of optimal system operating performance and output.

4) Identify and specify the criteria to be used for evaluating the congruence of system objectives, performance, and output.

5) Identify and select alternative groupings of system components for evaluation in terms of practicability, desirability, and cost benefits, and determine the tradeoffs involved.

6) Test selected alternatives to collect data upon which decision makers may base their choice of the configuration of system components for implementation. (Tracey, 1971, p. 4).

The major principles of instructional design may be subdivided into four categories:

1) Preparation.

The instructor must know clearly what his goals are for each lesson.

The learner should know what the learning goals are.

The learner should see the learning goals as attainable.

The instructor should assemble the material in a sequence meaningful to the learner.

2) Presentation.

The instructor should use training aids to facilitate learning, and for no other purpose.

The teaching experiences should appeal to as many of the learners' senses as possible.

Both the instructor and the learners should use demonstrations wherever possible.

3) Performance.

The instructor should find out, at each step of the learning experience, what the learners are learning.

Each learner should demonstrate success at each stage before proceeding to another stage.

Learners should have the opportunity to practice what they have learned.

Learners should have both immediate and progressive

knowledge of their results.

Learners should have freedom to make mistakes and correct them.

Learners should have opportunity to repeat their successes.

4) Follow Through.

The learner should know where he stands and how well he is doing.

The learner should be rewarded as soon as possible after success.

Each learning unit should have connection to the total learning experience.

The instructor should modify his teaching plan and procedures when desirable to ensure that the students learn what they are supposed to learn. (American Management Association, 1975).

Mehrens and Lehmann offer the following checklist for test construction:

1) specify the course or unit content.

2) list the major course or unit objectives.

3) define each objective in terms of student behaviour.

4) discard unrealistic objectives.

5) prepare a table of specifications.

6) decide upon the type of item format to be used.

7) prepare test items.

8) evaluate the degree to which the objectives have been learned by the pupils.

9) revise the objectives and/or teaching method and/or test on the basis of the test results. (Mehrens and Lehmann, 1973, p. 178).

What does one do with test scores to get the maximum information from the results? Downie and Heath suggest the following:

1) Averages can be calculated. These averages give a picture of the typical performance of the groups.

2) The variability of the measurements can be determined. By using the average as a point of reference, one can determine how scores or observations spread about this central point.

3) Graphs, tables, and figures can be prepared to portray clearly the nature of the group or groups.

4) The "raw" scores can be transformed into a more meaningful form, for example, centiles and standard scores, or letter grades.

5) The relationship of one variable to another can be determined.

6) The reliability of the measurement instruments can be determined.

7) The validity of the measurement instruments can be determined.

8) One set of measurements, or a combination of variables, can be used to predict future status or behaviour.

9) From the measurement of a sample of individuals, inferences can be made about the larger population from which the sample was drawn.

10) The performance of one group can be compared with that made by another, and the significance of any difference can be tested. (Downie and Heath, 1965, p.3).

The literature was reviewed for references to other studies involving audiovisual introductions to technical courses for non-technical audiences. Most of those which were found proved to be anecdotal accounts lacking hard data. Some of those which seemed more applicable to the author's project were Wendlandt's (1975) description of a tape/slide chemistry course for non-science majors, Coulter's (1975) description of a multimedia approach to physics, MacLean's (1975) description of audiovisual training for power plant employees, Clements' (1972) description of tape/slide presentations for pharmaceutical representatives, Horner's (1973) account of an integrated self-paced company training system, and

Nievergelt, Reingold, and Wilcox's (1974) description of automated computer science courses.

The literature reviewed for other topics is covered in the appropriate later sections of this paper.

The guidelines listed above and the precedents set by previous studies were considered, and in the light of the constraints under which the project was conducted, many of them were utilized. Details of the development are given in subsequent chapters.

CHAPTER TWO

Systems Requirements

2.1 Goals and Functions

The company's goal was to teach the MARK IV computer retrieval language to user-department personnel. The goal of the project was to improve the quality of instruction in MARK IV for these people.

The function of the course was to provide a method by which people with little or no background in computers or programming could learn, primarily by themselves, the MARK IV computer retrieval language.

2.2 Identifying Training and Development Needs

This subheading, according to Tracey's (1971) scheme, encompasses all training needs that a company might have, both present and future, oriented both towards job-skill development and towards personal development. He recommends determining what these needs are by analysis of job descriptions, personnel records, operating problems, long-range forecasts and the like, and by interviewing (by questionnaire or structured discussion) supervisors and employees.

The author was not required to establish the training need

for this project. She was presented with a previously-determined need; that of providing efficient user training in MARK IV. Whether in fact this need was valid and justified was not open to discussion, having been determined several levels higher in the company structure.

2.3 Collecting and Analyzing Job Data

Most of the MARK IV students work in user departments, doing various clerical jobs. The "job" to which Tracey refers is that which students would be expected to perform at the end of the course- in this case, to write simple MARK IV programs. Figure 2 illustrates the task analysis of writing a MARK IV program.

Actually, only a small percentage of "graduates" will ever be expected to write (i.e. flowchart, code, run, debug, test, document, and catalogue) complete programs. Most will be required to "patch" existing programs, or, following someone else's directions, make a small modification to a program. This would normally be done under supervision. Many students will not even do this much; they will only be expected to recognize which part of a computer printout is the report and which part is the program, and separate the pages accordingly. For them, learning to program is really meant

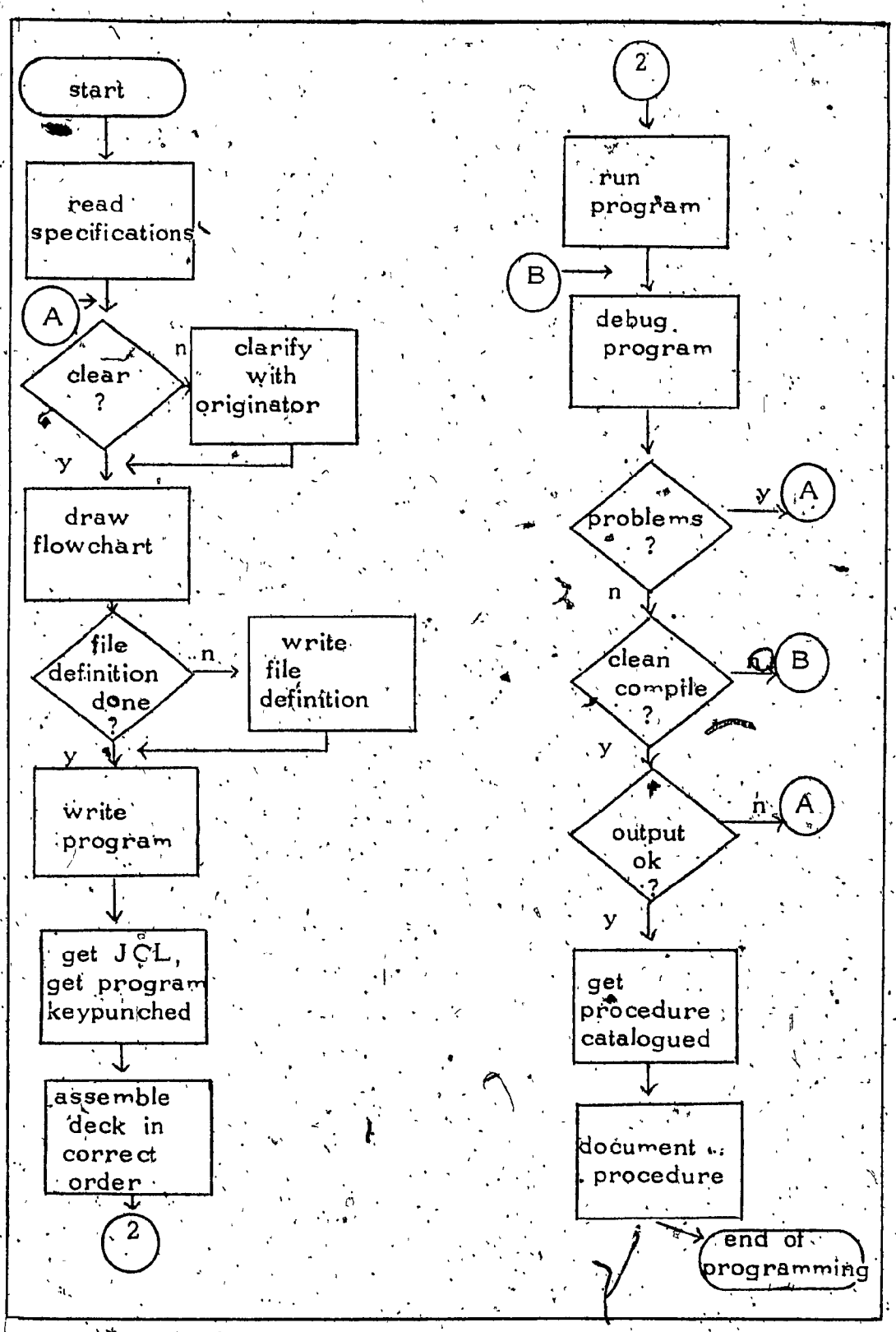

Figure 2. Task analysis for writing a MARK IV program.

to lend enrichment to their clerical jobs. The problem is that nobody knows at enrollment time which students will eventually do what, so the expectation has to be that all will perform the full job in the end.

2.4 Selecting and Writing Training Objectives

The author developed objectives for the course and for each of its component units, loosely following the taxonomies of Bloom (1956) and Gagné (1970), and the strategy of Mager (1962). These objectives are included in Appendix B, in the form in which they appear to the student in the course material.

2.5 Constructing Evaluative Instruments

Tracey defines "evaluative instruments" as a means of appraising the components of the system and their interaction. (This is opposed to criterion tests, which are a means of evaluating student learning.) He describes the three types of evaluative instruments- rating scales, questionnaires, and standard interview forms.

For purposes of developmental evaluation of the MARK IV project, questionnaires and informal interviews were used, on two occasions- one set of questions following the Introductory

unit, and another following the course.

One sort of question which might have been asked after the new Introduction, namely, "what did you think of the slide show?" could not be asked directly, because many of the students were on another course at the time when the author was producing the slides, and consequently, witnessed the show in the making. It was expected that these people would not answer such a question negatively for fear of offending or hurting the author, who had the power to fail them in the course if she saw fit. Moreover, without explicit critical guidance, answers to such blanket questions tend to be vague and of limited validity.

Appendix I contains the evaluative questions which were asked at the end of the new introductory unit.

Follow-up questions.

The follow-up questionnaire used was developed by the Education Centre for general use in evaluating courses. It is included in Appendix L. In addition, since the questionnaire is a general one, each respondent was telephoned and verbally asked the following question: "Have you, since you finished the course, used MARK IV in your job?". Their answers to this question were tabulated along with their answers to the other questions on the follow-up questionnaire. These are included

in Appendix M.

Population indicators.

Two measures were available as indicators of the kind of population from which the students came, but not enough MARK IV subjects had taken the measures for them to be used as pretests. These measures are the final examination for the course in Computing Systems Fundamentals (CSF), and the IBM Aptitude Test for Programmer Personnel. Both are standardized tests.

2.6 Constructing Criterion Measures

A criterion test measures to what extent objectives have been realized. Tracey calls a final examination an "end-of-course qualification test" (Tracey, 1971, p.140) and states that it should be "a comprehensive measure of the trainee's ability to perform the full range of job duties and tasks for which training has been provided."

In view of the above definitions, the hands-on problems and the quiz at the end of the introductory unit of the course may be called "criterion tests", and the final hands-on problem, the "qualification test".

Designing the course problems.

The Data Logic MARK-IV workshop which the author attended in May 1975 provided the basis for the hands-on problems which were added to the course. Each problem included was intended to illustrate and reinforce the concepts introduced in the unit preceding, and each problem was designed to build on the knowledge gained from previous problems and units. The previously-defined objectives for the units were the starting points in the formulation of the problems. (Appendix C includes the Student Guide and problem specifications, reproduced in thesis format.)

The first four problems are very simple retrievals from a card file consisting of cartoon characters' names, fictitious birthdates, and service dates. As well as providing experience in manipulating the Information Request form, these are intended, by virtue of their whimsical content, to relax the typical student, for whom these programs are his first encounter with the wierd and wonderful computer.

The next two problems are File Definitions, the second more complicated than the first. The first four problems required the student to read and follow output specifications; these two require him to read and follow input specifications.

The seventh problem requires the student to do some very simple mathematical manipulation of a file which he must

define and to produce a somewhat more complicated report than he had up to this point.

The final problem (qualification test) requires the student to produce three increasingly more difficult reports from an excerpt of a non-imaginary file, one which many of them will in fact encounter back at their jobs.

Designing the criterion test for the Introductory unit.

A criterion test was written for the completely rewritten Introductory unit, from the objectives stated earlier for this unit. The questions were deliberately formulated open-ended, to allow for individual interpretation, and to provoke discussion between students and the author. (One of the author's chief functions as a Course Advisor is to personalize the relatively impersonal audio-visual courses used by the Education Centre, as much as possible, in order to relieve as much as she can the sense of alienation and isolation that students often feel in this type of learning environment. Toffler's "Future Shock" (1970) describes this feeling well.)

Bloom, Hastings, and Madaus (1971) was the reference for question formulation.

The majority of the test items are technical questions about MARK IV requiring short answers to avoid the suggestion difficulties inherent in multiple choice objective

questions. Since the Introduction was meant to provide an overview of what would come later in the course, any items of importance would be covered again in subsequent units. A short quiz was felt to be the most efficient way to test recall of these points and to provide a springboard for thought and discussion.

Appendix H contains the criterion test for the Introductory unit as used by one treatment group. Appendix I contains the same test, with the addition of the evaluative questions answered by another treatment group.

Both the problems in the Student Guide and the criterion questions for the Introductory unit were submitted to three experienced MARK IV programmers familiar with the old course for comments, and were revised accordingly.

CHAPTER THREE

Systems Development

3.1 Selecting and Sequencing Course Content

Tracey cites job data as the primary source of training system content (Tracey, 1971, p. 171), with documentation as a secondary source. He advocates writing a broad task analysis of the job in question, and then expanding this outline until a detailed statement of content is produced.

The primary criterion in sequencing course content, according to Tracey, is that the order of presentation make sense to the trainees. He lists five types of ordering, and advocates the use of an appropriate mix of these. The categories are: logical order, problem-centered organization and sequencing, descriptive order, job performance order, and psychological order.

It was not economically feasible for the author to completely rewrite the course, nor was the time available to do so. The best compromise seemed to be to use as much of the old course material as possible in the new course, supplementing or replacing it where necessary.

After examination of the scripts for the old course audio tapes, the author decided that the content was basically

adequate (except for the Introductory unit), but that the sequence should be changed.

Basically, the new version of the course presents Simple Reporting before File Definitions, even though one must have a defined file before one can write a report. The intended audience was familiar with output documents, but not with input, and beginning the course with familiar material, it was reasoned, would give the students some confidence and a base from which to build.

The order of the old course was: Introduction, File Definitions, Simple Reporting, Extended Reporting, Run Control and Miscellaneous.

The order of the new course became: New Introduction, Simple Reporting, File Definitions, Extended Reporting, Run Control and Miscellaneous. (Logical and psychological order).

The Introductory unit of the old course seemed to be more an advertisement for the manufacturer's product than an overview of the rest of the course. The author, in consultation with the Education Manager, decided to rewrite the Introduction as a slide/tape presentation, providing a better introduction to MARK IV and containing certain information which people programming at CP would want to know.

3.2 Selecting and Using Training Strategies

Tracey differentiates between instructional strategy, instructional method, instructional technique, system of organization, and mediating device. He also discusses the factors which constrain strategy and selection.

In applying Tracey's strategy scheme to the MARK IV project, the following assignments are made:

The primary instructional method is programmed lectures and hands-on experience, supplemented by one-to-one tutorials.

The instructional technique is the use of audio tapes and accompanying visuals.

The system of organization is individually-paced.

The mediating devices are cassette tape players, a remote-access computer terminal, and a Caramate slide/tape playback unit. (See Appendix D for a description of the Caramate.)

The overall instructional strategy is system-control of topic sequencing accompanied by learner-control of pacing and repetitions. The conceptual strategy used was to start with a general overview and then deal with various particular skills and facts, and then bring these together in global problem solving. (Landa, 1974).

3.3 Selecting Training Aids

Tracey defines "training aids" as "anything that assists the instructor in conducting training", and lists the following categories: printed or duplicated aids, projected aids, graphic aids, three-dimensional aids, and auditory aids. (Tracey, 1971, p. 240). He discusses procedures and criteria for their selection and use, emphasizing that a training aid must meet the objectives and support the strategy, and should not be used merely because it is available.

The training aids which were used in the MARK IV project were the card decks for the hands-on problems, the slides and tape for the Introduction, the Student Guide, and the binder containing the visuals which accompanied the audio cassettes. Such training aids as film, videotapes, and programmed instruction were rejected due to company reauirements. The underlying reason for this decision was the time and cost involved in their preparation and use.

Holden's hardware and software selection worksheets (1973) were filled in, for the sake of comparison. (Appendix F). Fully-programmed instruction seemed the most applicable software, and this was actually what was used- all students progressed through the same material, at their own speeds, and the remedial branching or looping was in fact either

repetition of a portion of a lesson, or one-to-one tutoring.

Programmed text, audio tape, or slides with sound seemed to be the most appropriate media choices, given that the students had very different ways of relating to learning, different motivations and abilities, and at least high school reading level, and that the project had to be low cost and quickly prepared, and for use on an individual basis.

Steps in preparing the card decks.

One card deck containing the required Job Control Language (JCL) and data, and the correct MARK IV cards, was made up for each problem in the Student Guide. These were then run on the computer to correct any "bugs", and so that the author could see exactly what a correct solution should look like. The MARK IV cards were then removed, and thirty-five copies of the deck were gang-punched and interpreted. The card colours used were in accordance with CP Information Systems standards- orange for the Job cards, yellow for the JCL, and white for program cards. In addition, clue cards for the students (example- "insert RC and requests here instead of this card") were punched on green cards and inserted in the decks in the correct places. The decks were then packaged, filed in cardboard boxes, and shelved with other course materials.

Steps in writing the script for the Introduction.

First of all, the script of the original Introductory tape was transcribed from the tape. The result of this effort was then condensed into a list of topics covered. The author then compared this list with the objectives that she had written for this unit, and added to the list of objectives those covered by the old course which she felt were valid and should be included in the new unit.

A first draft of the script for the new unit was then written, following Bruner's theory of spiral learning and Ausubel's theory of expository teaching and organizers. (Lefrancois, 1972). It was shown to three experienced MARK IV programmers, and modified according to their suggestions. The author then made a preliminary recording of the second draft of the script. After listening to it several times, she rewrote it once again. Appendix E contains the final version of the script for the new Introduction. Table 1 analyzes a portion of this script for underlying design principles.

Bruner's theory of spiral learning is evident in the course structure as a whole, as each form is briefly discussed in the Introductory slide/tape presentation and referred back to in more complicated fashion in later units. And the Introduction can be seen as an example of Ausubel's organizers

slide	audio	analysis
# 29 (graphic)	In order to use the MARK IV system, you must learn the MARK IV language, and that is what this course is all about.	generally related; statement of the objective.
# 30 (photo of all forms, fanned out)	Programming in MARK IV is accomplished by filling in several preprinted forms. These are then keypunched.	generally related; expository organizer
# 31 (photo of cards going thru reader)	When combined with the required JCL, or Job Control Language cards and data cards, the resulting deck is read into the computer.	generally related; expository organizer
# 32 (graphic)	Your program, consisting of the cards you created with the MARK IV coding forms the JCL, and the data, activates the collection of programs and procedures called the MARK IV system.	indirectly related; comparative organizer
# 33 (photo of printer printing)	The results of your program come out on the printer.	generally related; expository organizer

slide	audio	analysis
# 34 (photo of coding forms, fanned out)	Now let's look at the coding forms. The rest of the course will teach you exactly how to fill them in. This lesson is meant only to introduct them to you.	generally related; statement of objective.
# 35 (photo of IR form)	The first form you will learn about is the Information Request, or IR form. You will recognize this form by its light blue colour, its title, and the pre-printed code IR in columns 9 and 10.	directly related; comparative organizer.
# 36 (photo of IR form with sections marked off)	The IR form is used to produce simple reports. There are four sections to the form.	directly related; expository organizer
# 37 (photo of the first part of the IR)	The first part of the Information Request form is where you specify your programming logic, or your selection criteria. Which records do you want included in your report? Which do you not want?	directly related; comparative organizer

slide	audio	analysis
# 38 (photo of the second part of the IR form)	The second part of the form is where you indicate what you want your report to look like. How far apart do you want your columns? Which fields do you want printed? What kind of totals do you want? In what order do you want your report?	directly related; comparative organizer

Table 1. Analysis of a representative portion of the Introductory unit script.

(expository for some students and comparative for others, depending on their backgrounds), while the Introduction itself is an example of expository teaching. The course as a whole is a mixture of expository teaching, discovery learning, and problem-solving. (Lefrancois, 1972).

Preparation of the Student Guide.

The Student Guide, consisting of the hands-on problems described earlier and reproduced in Appendix C, was meant to chart the students' progression through the course, hopefully eliminating the need for the question "what do I do next?!!". The problems required by the Student Guide form a part of the criterion measure as well as serving as a training aid because the student's success or failure in the course is determined by his success or failure to complete the problems rather than by his success on an examination. In short, the Student Guide is a written summary of what the student is expected to be able to do at each stage of the course, and it defines for him the order of doing things in the course.

Steps in designing the graphics for the Introduction.

The final script was typed on paper ruled so that seven or eight half-lines of type corresponded to one visual box. (See Appendix G for a sample of the script form used.) The author then sketched in the boxes ideas which she thought would make suitable slides. These were then discussed with the Graphics Coordinator at CP, who made some suggestions for modifications. At this time, the Graphics Coordinator left the company, and the author was forced to undertake the responsibility of doing the required artwork herself, even though she is not an artist.

The next step in the graphics design phase was to break down the seventy-three slides into categories according to their requirements. (The four categories were: those requiring lettering only, those requiring artwork only, those requiring

a combination of graphics and lettering, and those requiring location photography.)

The literature was reviewed for hints and suggestions. Prompting techniques such as those described by Lumsdaine et al (Anderson et al, 1969) were incorporated. Minor's book (1962), which talks about various artwork techniques in a very simplified, step-by-step manner, was invaluable reference material. And Bullough's discussion of the principles and elements of good design (1974) was also useful in defining what to do and what not to do. Bullough's argument for black and white visuals instead of coloured ones ("it takes a subject about four times as long to 'zero in' on a coloured visual than on a black and white one"(p: 100)) was read and adopted with relief by the author, who was aiming for simplicity wherever possible. Dickinson's discussion about ways to help adult learners with defective vision lent further support to the aim of simplicity. He said that "charts, diagrams, or pictures should be large, with maximum colour contrast. Allow sufficient time for the presentation of visual materials so that the students don't feel too rushed." (Dickinson, 1973, p. 31) And, referring to wording in graphics, he said that "only important and relevant items should appear. Use simple words or phrases, and large, legible writing or printing." (Dickinson, p. 31)

Preparation of graphics.

The graphics were categorized as follows: those requiring lettering only, those requiring artwork only, those requiring a combination of lettering and artwork, and those requiring location photography.

Those graphics requiring lettering only were prepared in the following manner.

Mock-ups were typed in upper-case letters using Pica type, on white paper. These were then retyped, using the size 670 12-A type font, with an Addressograph-Multigraph Varitypewriter, on white paper. These sheets were then enlarged 300% and printed on negative paper (i.e. blown up and reversed) using an Itek-480 process camera. The large reversed sheets were then photographed with a variety of colour filters, using a Forox model ss slide/strip camera and copy stand with a 55 mm F/3.5 micro-nikkor lens. Kodak 35 mm Ektachrome tungsten film, ASA 125, was used. The slides were mounted in plastic mounts.

The reason for having reversed slides is stated by Langford (1973, p. 135)

Black on white background or black on yellow are the

combinations most easily read. However, they are also often the most tiring. White lines on black can be quite acceptable, are certainly less tiring, and are very easy to produce. Such a predominantly black image minimises the appearance of dust.

Those graphics requiring artwork only were prepared as follows.

There were two types of artwork graphics- those using flowcharting symbols, and those using other shapes.

To produce the graphics using the flowcharting symbols, the symbols were first traced onto white paper using a black ballpoint pen and an IBM flowcharting template. The wording in the shapes was then varityped, and the shapes were subsequently cut out. The other artwork graphics were cut from magazine illustrations.

The cutouts were rubber-cemented onto 8 1/2 x 11 inch clear vizutate polyester film. Letraset lines, arrows, or other shapes were then added. The vizutates were overlaid onto Pantone (brightly coloured) backgrounds, and photographed with the Forox camera, as above.

Those graphics requiring both artwork and lettering were prepared using a combination of the above methods-

those which required lettering primarily were varityped; the extra material was added, and then the result was blown up, reversed, and photographed. Those which required artwork primarily were cut and glued, Letraset letters were added, and then the results were photographed.

Those slides requiring location photography were listed and grouped by location. A photographer then came to the appointed locations, and, on instructions from the author, took the required photographs, using a Nikkon F camera with 50 mm F/2.8 and 35 mm F/1.4 lenses, two 3200 K quartz lights, and Kodak 35 mm Ektachrome tungsten film, ASA 125.

Preparation of the tape.

The author herself was not the voice on the final version of the tape, for the following reasons.
Firstly, the old tape used several unfamiliar male voices. It would have introduced more variables to have had a recognizable (to the students) female voice on the experimental tape. And secondly, the author's voice is too low-pitched and even for interesting recording, in any case.

Mr. Michael Lavigne, a Systems Analyst and

experienced MARK IV programmer, was asked to be the voice on the tape. Mr. Lavigne had done similar tasks in the past, with good results, and although he is not a professional actor, he does have a good voice, and he didn't charge for his services.

The tape was made in a windowless inner office after normal working hours, using a Sony TC-121 stereo cassette deck, using the pause button and automatic recording level. The original tape was a Radio Shack 45-minute Supertape cassette. Two microphones taped to the desk were used, about eight inches from the speaker's face. Four frames were recorded at a time, to minimize the sound of paper fluttering.

The recorded cassette was then inserted in the Caramate machine, and the pulses were added according to the asterisks in the script.

Preparation of the revised binders.

New unit dividers, made from orange Mayfair stock cut to size, were inserted in the binders containing the foils. The binder pages were updated where necessary, to reflect the new numbering system. The objectives for each unit, developed in a previous phase, were printed on Goldenrod letter paper, and inserted at the front of each unit. An updated course description was written as well, and inserted at the front of the binders, after the new title pages. Appendix B contains the course description and objectives.

One prototype binder was shown to three experienced MARK IV programmers (all of whom were familiar with the old course), and was subsequently modified as per their comments. The remaining binders were then updated, with the exception of one, kept in storage in its original form.

The lettering used in the updated materials was a combination of LeRoy mechanical lettering, Letraset, Varitype, and ordinary typewriting. Orange Mayfair stock was selected for the divider pages because the binder covers were that colour, and Goldenrod paper was used for the objectives insert pages because it provided visual contrast.

3.4 Determining Equipment Requirements

Tracey categorizes three types of training equipment- standard classroom fixtures such as desks, standard training aids such as projectors and chalkboards, and specialized training equipment such as typewriters, power tools, and optical simulators, and advocates the determination of equipment requirements two to five years in advance of the training session. In order to determine equipment requirements, information must be obtained about current and future equipment commitments, availability of equipment, costs, and trainee scheduling.

For the MARK IV project, it was determined that one Caramate machine and thirty-five sets of books would be sufficient for a throughput of fifteen trainees per month. Other equipment, such as a remote job entry computer terminal, desks and chairs, keypunch machines, and magnetic chalkboards already existed.

Projected enrollments for the MARK IV course up to early November were tabulated, and thirty-five sets of manuals (Reference Manuals and Users' Guides) were ordered from Informatics. Thirty-five copies of the Student Guide were photocopied and collated, and thirty-five copies of the card decks

for the hands-on problems were prepared. Arrangements were made with the Central Reproduction Bureau (CRB) to print enough pads of the various coding forms used in the course. (The exact number is vague because this order was included in the general order for Information Systems stationery.) Provision was made with Security for passes for students to enter the restricted area of the remote job entry terminal. And, just in case, copies were made of all the tapes used in the course, and stored.

3.5 Producing Training Documents

The Education Centre publishes annually an Education Guide which gives a one-page summary of each of the courses available to User departments. This is fairly close to Tracey's idea of "training documents". The current description of the MARK IV course is reproduced in Appendix O.

Other training documents, such as lesson plans, were not available, because there were no "lesson plans"; the course not being of classroom format.

CHAPTER FOUR

Systems Validation

4.1 Selecting Instructors

The author, employed by Canadian Pacific Limited as a Course Advisor, was the instructor for the course by virtue of her position in the company. Previous to this, she had been employed for several years as a COBOL programmer, so, even though she was unfamiliar with the MARK IV language at the beginning of the project, she was able to learn it fairly quickly. The author's training in MARK IV was accomplished by means of an intensive five-day workshop course given in Ottawa by Data Logic, Incorporated in May of 1975, and subsequent programming assignments.

4.2 Selecting Trainees

Trainees were chosen by their own departments to take the course. An individual would be selected for various reasons, ranging from his demonstrated talent and stated interest in problem solving to his manager's need to "get somebody trained" because his boss had told him to and quickly. Many students were selected for reasons other than those which the Education Centre would have liked, but, being a service department,

Information Systems is obligated to accept all prospective students who have the prerequisites required for their chosen courses.

Students scheduled their course loads as best suited them- full days, half days, an hour a week, or whatever. Attendance was generally sporadic and unpredictable, as, even with all good intentions, students rarely attended class as they had planned.

The ages and work responsibilities of the students ranged from early twenties to middle fifties, and from middle rung of clerk to department manager, with no correlation necessarily implied.

The time lag since students were last in a "school" setting was variable, ranging from a month to twenty-five years or more.

The prerequisite for taking the MARK IV course is an earlier course called "Computing Systems Fundamentals" (Advanced Systems, 1969) or its equivalent, but many students did not in fact have this prerequisite, and the author could do little to remedy this gap in entering competencies, other than to provide more-intensive tutorials for those students who seemed in need of them.

4.3 Conducting Instruction (tutorials)

Setting.

The course was held at CP's Information Systems Education Centre, Room E-21, "A" floor, Windsor Station, Montreal. Students were required to do all their course work here, except for the actual computer runs. These took place from the Information Systems Remote Job Entry terminal (RJE).

The Education Centre was formerly a vault. It is still stuffy, poorly ventilated, and noisily air-conditioned. The classrooms of the Education Centre are often pressed into service as meeting rooms, with consequent "bumping" of students from one room into another, from comfortable seating arrangements to those more cramped.

The classroom furniture arrangement was flexible due to the multiple uses made of the two classrooms. Usually, (and it was attempted to schedule students to this aim), each student had a table (two by three feet) to himself. Here, he could do the required reading and writing, and he could bring one of the two Sony TC 121 tape recorders when he had to listen to a tape. The Caramate machine was set up to show the first module for the experimental group in another room, also used

as a library. Both the Caramate and the Sonys were used with headphones out of respect to the other students in the room.

The Education Centre facilities were available to students from 7:45 A.M. to 7:00 P.M. Monday to Friday. The Course Advisor (the author) was available for consultation and tutoring from 8:30 A.M. to 5:00 P.M. Monday to Friday.

Administration of the course.

When the student would appear at the confirmed time, the author would greet him, show him around the Education Centre, give him the required books for the course, point out the sequence of events listed in the Student Guide, show him where the cassettes and foils were kept, and leave him to his own devices in one of the two classrooms.

When he had finished the first module and asked the author for the quiz, she would give it to him, score it, and discuss it with him. (Immediate knowledge of results.)

When he was finished with tapes two-A and two-B, the author would show him where the coding forms were kept and encourage him to try to do the first four problems by himself.

When he was finished coding the first four problems, the author would look at the coding with him and call his attention to places where he had misread or forgotten about the output specifications. She would also point out out why his handwriting would cause the keypunch operator grief, and tell him what the conventions were--for example, 0 is numeric zero, Ø is alphabetic letter "O", 1 is numeric one, L is letter "L", I is letter "I", and so on. The author would assist the student in filling out a keypunch request form, and show him where to leave it and where to retrieve his punched cards.

When the student had retrieved his cards, the author would explain to him why it was necessary to "eyeball" them (i.e. to verify the cards by eye), and would show him how the printed letters on the top line corresponded to the punched hole pattern.

When the student was finished verifying his cards, the author would give him the card deck containing JCL and data for the first four problems. She would call his attention to the imbedded clue card and see that he put his request cards in the correct place in the deck.

The author would then take the student to the Remote Job Entry terminal (RJE) and teach him how to operate the keypunch machine and the card reader, and show him where to retrieve his printed output.

When he had retrieved his printed output, the author would go over it with the student page by page, telling him what each section of the listing was. For example, "this is the Job Control Language, or JCL", "this is the data", "these are the cards you coded", "these are statistical messages from the computer". The author would point out the various messages and explain what they were for. (Type 0- message, type 1- warning, type 3- error) She would elicit from the student the reasons why he had done certain things improperly, and explain why they were wrong. They would look at the reports generated by the program, and the author would try to get the student to tell her how each line and column on the output related to the cards which he had coded. The author would call the student's attention to the places where his output did not match the specifications provided.

The author did not correct errors for the student, but attempted, by careful questioning and planted hints, to get the student to recognize his own mistakes and to fix them. If a student were so hopelessly confused that he was unable to progress even in very small forward steps, the author would tell him to take a break and then listen to the tapes over again, and redo the problems he had missed.

The student was expected to submit his coding for

professional keypunching, and to punch his own corrections. He was expected to submit his deck through the RJE as many times as necessary to solve the problems correctly. "Correctly" was interpreted to mean "when the Course Advisor sees the output and says that it is correct".

The author would go over resubmitted jobs with the student as many times and in as much detail as the individual student required.

When problems one through four were completed, the student proceeded with problems five and six in the same fashion.

When problems five and six were completed, the student proceeded to try problem seven. Typically, the student would require quite a bit of explanation at this stage. The ensuing discussion usually had the desired effect, and the student would within a few minutes show a spurt in understanding and be able to finish the problem unaided.

With problem seven out of the way, the student would usually be able to do most of problem eight-A, -B, and -C unaided. The author was, of course, available for assistance.

When the student thought that he had finished problems eight-A, -B, and -C, he showed them to the author, and invariably, the author would point out the difference between the student's output to problem eight-C and the specifications. She would then give him some clues to the editing trick he had missed, and would tell him to read the relevant section of the Reference Manual.

After he had struggled for a while with the editing trick, the author would show the student how to do it, since it was really a minor-if useful-point, and most people do not figure it out on their own. The student would then run the program one last time. (Hopefully. If he didn't get it right, he would run it again until he had.)

When the student brought the output of his last run for the last problem to the author, she would go through the listing with him, page by page, asking him to tell her what each section of the listing was. The student at this point should have been able to identify JCL, data, MARK IV run control cards, MARK IV request cards, reports, and types 0, 1, and 3 messages. He should have been able to state where a given field on the output came from, whether it was from the master file or from a temporary field definition, and why totals, control breaks, page numbering, and dates are printed as they are.

If he was capable of doing the above successfully (with a little prompting), the student was considered to have passed the course.

If he was not, the author would talk with him some more, try to identify his weak spots, and refer him to the appropriate sections in the Reference Manual. The author would then lead the student through the listing again. If the student still couldn't do it, (i.e. had done ten computer problems and still didn't know what he was doing) he was given the choice of repeating the course from the beginning, or accepting a grade of "unsatisfactory".

If the student did not complete the course (i.e. stopped before completing the last walk-through) he was telephoned and letters were sent to him and to his manager until he either returned to finish or admitted that he had dropped out, in which case he was given a grade of "incomplete" on the course.

Course materials (new course).

The updated MARK IV course for Users, as used at CP, consists of the following materials:

-six audio cassettes;

-accompanying binder containing foils to go with the tapes, objectives for each unit, and some reading material referred to

in the tapes;

-one Reference Manual;

-one Users' Guide;

-one Student Guide, containing problem specifications and the recommended progression through the course;

The Introductory unit, in addition, includes seventy-three two inch by two inch slides. The tape for this unit is synchronized to automatically rotate the slides when a Caramate rear-screen projection machine is used. (See Appendix D for a description of the Caramate, and Appendix E for the script for the Introductory unit.)

Developmental experimentation.

In an effort to appraise the effectiveness of the slide presentation in the new Introductory unit, three ways of administering this unit were devised.

One group of students, those who began the course in the first two months of its tryout period, read about two hours' worth of material in the Users' Guide, then listened to the old audio Introduction, and then wrote the Introductory unit criterion test.

A second group of students did the same reading, then watched the slide/tape presentation, and then wrote the same quiz, with some formative evaluation questions added to it.

The third group watched the slide/tape presentation, wrote the same quiz (with the formative evaluation questions), and then did the reading.

All three groups continued with the revised course, including the hands-on problems.

4.4 Administering and Analyzing Criterion Measures

Two conjoint criterion measures were used- the criterion test at the end of the first unit of the course, and the computer problems in the Student Guide.

The above section on the administration of the course describes how the Student Guide problems were handled. Generally, a student was judged to have met the criterion measure for a given problem when he had shown the author evidence of output that met the specifications. There was no "grading", except on a pass/fail basis.

The criterion test for the Introductory unit was handled somewhat differently. Each student, when he had finished the first unit of the course, requested the quiz from the author. He was then handed a copy, and told to complete it, closed book, taking as much time as he needed. Most people completed the quiz in less than half an hour.

The scoring procedure on the quiz was as follows:

One point was given for each correct answer, for a maximum possible score of twenty. A response was judged to be correct if it was on the author's list of permissible answers to that question. This list was drawn up after consultation with the panel of experienced MARK IV programmers who had commented on the draft of the test. If there was any doubt about a response being correct or incorrect, the author would verbally discuss the point with the student in the tutorial following the quiz, and if the student could convince the author that his answer was valid, he was judged to be correct on that item. Scores are included in Appendix K, and KR_{21} reliability on the quiz was .70. (Mehrens and Lehmann, 1973).

When the results of the quiz for the three groups were analyzed, no significant differences ($p < .05$) were found, although the Caramate and readings group had the highest scores and the old approach did give lower scores.

This finding is somewhat disappointing, as it indicates that either the slide/tape show was not really more effective in teach teaching the cognitive material, or that the groups were too small to provide statistical evidence using these tests. People did state (verbally) that they liked the slide show and found it interesting to watch, but this did not seem to help them learn any better. However, this is in line with Thorndike's conclusion. He found that "extrinsic interests are adequate

to maintain learning when intrinsic interests are not available". (Thorndike, 1935, p. 53).

In other words, whether the unit was more interesting in itself or not, the students had the same need to learn the material, and consequently, the same amount of learning took place, no matter which version of the Introduction they received, within the detection capabilities of the tests used.

A significant correlation ($p < .05$) of -.160 was found between the scores on the CSF key questions and the scores on the MARK IV Introductory unit criterion test for people who did both courses. This is somewhat mystifying, as it would seem to indicate that people who did slightly better on the CSF test do slightly worse on the MARK IV. (Why should people who score high on the prerequisite course tend to have greater difficulty with the following course? Perhaps it is because the CSF examination is conducted open-book, and people spend anywhere from three to twelve hours slavishly copying information which they really do not understand, whereas the MARK IV exam is conducted closed-book and asks people to write what they actually remember. Perhaps people who copy well are not good at recalling facts and concepts when forced to rely on their own memories. Perhaps people who can copy well are not very good at the kind of original thinking that programming requires.)

Item analysis for the different groups on the different items of the Introductory unit criterion test are shown graphically in Appendix J.

It would seem that most respondents knew the answers to most of the questions. The three questions with which the first treatment group (reading, old Introduction, test) had the most difficulty were numbers 4 (what distinguishes a File Definition form from other forms), 8 (what is CP's system delimiter and how is it used), and 9 (where is the RJE used by Information Systems and what is in it). This is understandable- the answers to numbers 8 and 9 were not on the audio tape, and number 4 was glossed over very briefly.

The second and third treatment groups (reading, new Introduction, test; and new Introduction, test, reading, respectively) had the greatest difficulty with questions 6, 7g, 8, and 9. Question 6 (what is the connection between File Definition and Information Request forms) perhaps requires a level of comprehension too high for most people who are new to programming altogether, and to the MARK IV language as well. Even though the required answer is included in the unit, it may well have gone right over the heads of people who answered incorrectly. Question 7g asks for the definition of "glossary", and is only superficially referred to in the unit. This is one item slated for revision.

Why all three groups had difficulty with questions 8 and 9, though, is not readily apparent. Perhaps asking non-Information Systems personnel a jargon-loaded question like 9 is not valid. Perhaps if the question had been phrased differently (where are the keypunches and reader used by Information Systems, or where would you go if you wanted to read in a job or keypunch some cards), more people would have gotten the item correct. Question 8 was really a recall item- the tape states that the system delimiter used at CP is the pound sign (#), and the question asks for exactly that information. The second half of the question (how is it used) was not discussed in any depth in the unit, because it was felt to be too specific a concept for the Introduction.

(Students' scores on all the evaluative measures are summarized in Appendix K.) Here, Figure 3 shows the average score for each group on the criterion test for the Introductory unit.

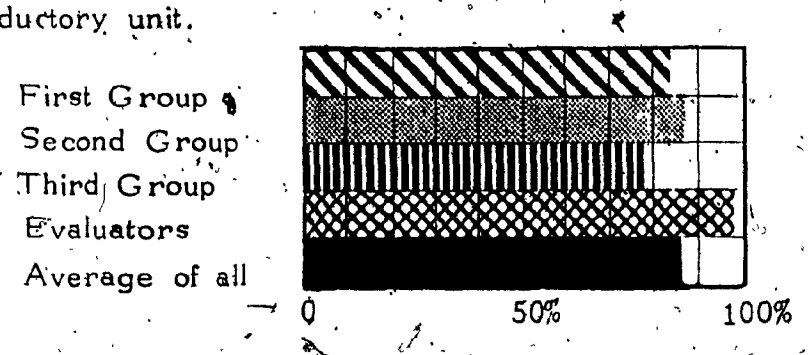

Figure 3. Average scores of all groups on the criterion test for the Introductory unit of the MARK IV course.

The final hands-on problem of the revised course was in fact the end-of-course qualification test, but unfortunately it could not be scored as such, due to system and administrative peculiarities, especially towards the end of the course. Most students at this point in the course were back at their jobs, and would appear at the Education Centre only to show the author their final correct solution to the problem. There was no objective way of knowing how many errors a student had made in arriving at his correct solution, and he often didn't know himself. The number of computer runs was often a function of the number of keypunch errors. Elapsed time was not a valid indicator, as computer turnaround was very slow at this time due to hardware problems. If a student took a week to complete the last problem, it usually was because of the computer rather than because of his lack of knowledge.

Generally, if a student presented a correct solution to the final problem, and could pick out various parts of his printout when asked, he was judged to have passed. This was a "go/no go" test- no grading was attempted on the problems. All trainees passed this "go/no go" test.

4.5 Evaluating Training Systems

Cost.

There were three kinds of costs involved in this project- charges for peoples' time, charges for materials, and hidden, overhead, or no-expense costs.

Table 2 shows these, along with the number of man-hours involved, where applicable.

Formative evaluation.

Members of treatment groups two and three were asked several formative evaluation questions as an adjunct to their criterion test for the introductory unit. Their responses are included in Appendix N. The overall impression seems to be that the unit was adequate- neither particularly good nor particularly bad. (It must be noted that the respondents to this questionnaire are people generally unfamiliar with course-taking, and consequently, they do not really know what constitutes a "good" or a "bad" course of instruction. What they think is "good" may very well be what they find easy- or the opposite, if they operate on the theory that if it tastes bad it must be good for you.) In any case, no very strong opinions were voiced about the slides or the tape, in either direction.

ITEM	PRICE ($)	NUMBER OF MAN-HOURS	COST ($)
* typing, varityping, clerical services	4.75/hr	15	71.25
* keypunch services	4.70/hr	30	141.00
* chartist's time	12.50/hr	4	50.00
* systems analyst's time (consulting)	17.00/hr	4	68.00
* the author's time	5.75/hr		
-designing the course		40	230.00
-doing artwork		45	258.75
-recording tape		4	23.00
-preparing course materials		20	115.00
-tutoring students	12.50/hr	150	1875.00
# tape cassettes	2.70 each	4	10.80
# course materials (manuals)	(breakdown unavailable)		475.00
# Data Logic MARK IV course and expenses		35	550.00
# paper-handling xeroxing and offset copies	.02 each	(?)	
colour copies	.35 each	(?)	20.00
# photographic services enlarging, reversing flat slides, location slides, copies of slides: TOTAL	(breakdown unavailable)		350.00
# art materials			25.00
TOTAL		approximately 351	4,262.80

ITEM	PRICE ($)		COST ($)
computer time			
R-JE transmission	2.00/1000 lines		
line printing	1.50/1000 lines		
card reading	2.60/1000		
CPU (IBM 370/165)	700.00/hr		
average job- less than 1000 lines, 1 minute, less than 1000 cards			
	17.75	x 4 problems x 3 runs each x 30 people	6390.00
Education Centre staff	40.00/hr	x 40 hr. week x 4 months	24960.00
Education Centre room space	5000.00/month	x 4 months	20000.00
Equipment- Caramate, two Sony TC-121 tape recorders, 3 sets of headphones, furniture	(approximate market price of this equipment- $600.) no cost- these were previous expenses for other reasons.		

Table 2. Costing information for the MARK IV project at CP

key: items marked with an * are peoples' time,
items marked with an # are charges for materials,
items not marked are hidden, overhead, or no-expense.

No formative evaluation information was available from the first treatment group on the old unit, although some of their responses to the follow-up questionnaire may be interpreted as bearing directly on the introduction.

It was not feasible due to internal reasons within the company to administer a formative evaluation questionnaire on the entire course on completion. In a controlled experiment, this would have been done. For purposes of this project, the responses on the follow-up questionnaire will have to serve both as follow-up and as formative evaluation.

Problems encountered during the preparation of the unit.

The first problem encountered was the loss of the Graphics Coordinator, which forced the author to either abandon the project or do the artwork herself. The author had no training or experience in art beyond what was on the high school syllabus, so this was a real dilemma. Fortunately, Miss J. Parker, Chartist, was available for consultation on such basics as how to use Letraset, what to use as backgrounds, how to arrange Varityped shapes, and how to do paste-ups. She could not do the work herself due to having inherited much of the Graphics Coordinator's workload and all of the deadlines.

The next problem was that the Photographic Services department's schedule did not allow for instant service on slides which had to be re-done. The author temporarily resolved this situation by photographing the remakes herself, using an Olympus OM-1 camera with a 50 mm F/1.8 lens and a 2 X teleconverter, two quartz lights, and ASA 64 tungsten Ektachrome film.

The slides which were made this way will be re-done again, properly; when time allows. In the meantime, the remakes, while not of the required quality, are correct in content.

The major obstacle to the recording of the tape was the background noise always present in the Windsor Station building. The first attempt at taping was in an inside room in the Education Centre, after normal working hours. The microphones picked up the sounds of a French language class which was taking place in an adjacent room. There wasn't enough time available for both the author and Mr. Lavigne, the voice on the tape, to find another building (a studio at Concordia was considered), so the best compromise seemed to be to find another room within Windsor Station. The final taping was made in an inside office after working hours, with the air-conditioning and the telephone turned off. The result was not perfect, but was

considerably better than the result of the first try.

Then, in copying Unit Two onto the second side of the Unit One cassette, the pulses were erased, due to the tracking configuration of the equipment. This problem was resolved by re-recording the pulses and having Unit Two on another cassette.

In the actual running of the study, it was found that not all students had taken the Computing Systems Fundamentals prerequisite course within the last year, which meant that their CSF results were not available for statistical comparison. There wasn't anything that could be done about this situation, and no conclusions about the calibre of those with no prerequisite course results could be drawn.

Weaknesses in the production and evaluation.

This project was, in computer jargon, "quick and dirty". This means that the project was put together in a hurry, with very little attention paid to fine points and details. The emphasis, due to the time constraint, was to get something functional produced, however imperfect it might be. It was known early in 1975 that a group of a hundred-odd users would need the course during the summer and fall of 1975 (and probably not

afterwards). There wasn't enough lead-time to spend on perfecting the system. There wasn't even enough lead-time to do a pilot run and make changes. The best that could be done was to ask subject-matter experts and trainees for comments and make revisions accordingly.

The main weakness in this project lies in its evaluative instruments. Although the Introductory unit criterion test had KR_{21} reliability (Mehrens and Lehmann, 1973, p.113) of .70, which is acceptable for a short teacher-made test, the other criterion tests (the hands-on problems) were too dependent on subjective interpretation for scoring. The scoring process for these was intuitive, and, at the very least, these intuitive guidlines should be set down on paper. The reason that they were not was, again, because of the time constraint.

It must be remembered that 1975 was a generally bad year for businesses, and CP, like other companies, was forced to reduce and re-assign personnel. This meant that an already-shortstaffed department could even less easily spare people to be on course for any extra amount of time. People were constantly being urged by their managers to hurry and finish the course and get back to their desks. The author could not ask these people to spend even more time on course, writing more quizzes and questionnaires.

The time constraint applied to the author's time as well. The Education Centre became shortstaffed by one, and then by two people, increasing the author's responsibilities at precisely the time when she should have been validating examination questions. So the "quick and dirty" approach was applied in this area as well, and examination questions were left open-ended and ungraded. Discussions with each student would clear up any any gaps in his knowledge, and the quiz on the Introduction was used more as a basis for discussion than as a formal, marked examination. This is not according to proper course design theory, but was the best that could be done at the time.

Unexpected, tangental findings.

Some unexpected bonuses came the way of the Education Centre as a result of doing this project.

The CSF final examination had always been scored and the results gone over with the student, but it was not until this project that the results were charted and analyzed.

As a result of this analysis, the CSF course is to be phased out, and another, more current, course is to be bought in 1976. Hopefully, this new acquisition will teach certain

concepts which really are prerequisite to the learning of a programming language, so that there will in the future be a high positive correlation between scores on this course and success in the MARK IV course.

Also in 1976, the Education Centre will acquire a copy-stand, so that photographs may be taken properly and easily, when Photographic Services cannot meet the (often unreasonable) deadlines set by the Education Centre.

Armed with the confidence gained by successfully doing the artwork for this project, the author will collaborate on the revision of another course in the near future.

And, as a result of trying to tutor students who attended irregularly, the author (in another function- scheduling students) will set up a new enrollment procedure for 1976, involving attendance on a much more regular basis as one of the ground rules.

4.6 Following Up Graduates

Appendix L includes the questionnaire used in the follow-up of the students. Appendix M includes the item analysis of this questionnaire, in graphic form where applicable.

This questionnaire, in a controlled experiment, would have been administered at a certain amount of time (three months is a good figure) after each student had completed the course. For internal reasons within the company, this was not possible to do. The best compromise (the other alternative was to have no follow-up at all) was to send the questionnaires out all at once. This meant that some people received them four months after completing the course, and some people received them while they were still in the process of completing it.

Results indicate that most people thought the course was at least adequate, and learned what they had needed to. The great majority of respondents took the course because they needed to know MARK IV for their jobs. Many people thought that the practical programs were the best feature of the course, and that the worst feature of the course was the content of the tapes and not enough advisor assistance. Several mentioned that they had liked the slide/tape presentation, for the variety it provided and for the overview and structure it lent to the

course.

Unfortunately, only half of the respondents stated that they had used MARK IV in their jobs since completing the course. This really is too bad, because it means that, when those who have not yet used it are ready to, they will need a refresher course.

More importantly, though, it does not lend credibility to a course when people struggle over it and then are given no chance to apply what they have learned. They probably will not put as much heart into the next course they are asked to take, because they probably will not have to use that one, either. And this kind of experience creates the kind of lackadaisical student who requires a disproportionate number of telephone calls and letters to nudge him into attending class regularly.

CHAPTER FIVE

Conclusions

The aim of this project was to improve the quality of instruction of the MARK IV computer retrieval language for User personnel at Canadian Pacific Limited in Montreal. This aim has been met, although the course which now exists still has some drawbacks which are to be remedied in the future.

The development of slide/tape shows for other units of the course would seem to be in order. The author has learned several things from this project which will be applied to other, similar projects.

One such item concerns the length of each presentation. Due to the complexity of the material, each lesson should be kept short. The first tape was fifteen minutes long; successive tapes (which would deal with more complicated topics) should probably be shorter for the most effective learning to take place.

A better setup should be devised for recording these tapes. There was too much extraneous noise, and too much stopping and re-starting on the first tape.

Another item of knowledge gained by the author concerns the graphics. Based on informal discussions with students, MARK IV programmers, and people experienced in artwork,

the author has concluded that simple graphics are quite acceptable to viewers, and mechanically-produced lettering (i.e. varitype) is as favourably received as the more time-consuming (to prepare) Letraset, although Letraset allows for more variety in lettering types, sizes, and colours.

There were no negative opinions expressed by the students about the Caramate.

Future presentations for use with the Caramate machine should be kept short and simple. Although flourishes and frills might make a presentation more interesting, a simpler production would seem to be quite as acceptable, given a limited budget and time allowance. Further research would determine whether a simpler presentation is in fact as effective as a fancier one.

The author designed and produced the slide/tape presentation herself, with assistance from typists and photographers, advice from an artist and several subject-matter experts, and another person's voice for the taping. It is certainly possible for one person (with appropriate background and technical knowledge) to do such a project. However, if the person designing the course has a limited knowledge of the subject matter, technical backup would be required. Because this particular project was done primarily for a company, certain aspects of it were done

by people other than the author (i.e. typing and other clerical assistance, varityping, photography). But the author, had she been a full-time student without a company's personnel and resources, could probably have done the entire project singlehandedly, using personal funds, a group of students on loan from a cooperative professor, and occasional advice from a MARK IV resource person, an artist, and a photographer.

Tracey's model is almost exactly the procedure the author would have intuitively followed had she not been aware of the model model. It is a logical step-by-step procedure for designing, implementing, and evaluating courses, and the author will definitely utilize it in further projects of this type.

One comment should be made about the formative evaluation questions used in this project.

Interview-type evaluation was used where applicable because the number of subjects participating in the study was small enough that the development of reliable formative evaluation questions would have been very difficult. Had a larger population been available, more emphasis would have been placed on the development of this type of question.

The author has learned a great deal about conducting course development, making paste-ups, tape recording, and one-to-one teaching. For her own professional growth, this project has been a worthwhile endeavor. And from the company's viewpoint, it has been worthwhile as well- MARK IV education has been modified for the better, and some areas for future concern have been identified. The systems approach may not be practicable under time and resource constraints, but some of its principles can always be applied.

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APPENDIX A

Description of MARK IV

MARK IV is a proprietory software package produced, marketed, and supported by Informatics Inc. MARK IV Systems Company, Canoga Park, California. Its primary function is as a file management system. The coding of several preprinted forms produces a retrieval program which accesses the MARK IV system of procedures to produce up to 255 reports with one pass of the master file.

MARK IV requires very little knowledge about computers, and next to none about programming, which is why it can be effectively used by non-programmers. The average person with no knowledge of any other programming language can learn MARK IV in about five days. That same person would require at least a month to learn a conventional language like PL/1. (These figures represent the experience of the Education Centre at CP.)

Figures A-1 through A-8 are half-size reproductions of the MARK IV coding forms used in the User's course at CP. The form illustrated in Figure A-1 is actually light blue in colour. The forms illustrated in Figures A-2 and A-3 are bright yellow. Those illustrated in Figures A-4 through A-7 are light green, and the form illustrated in Figure A-8 is white.

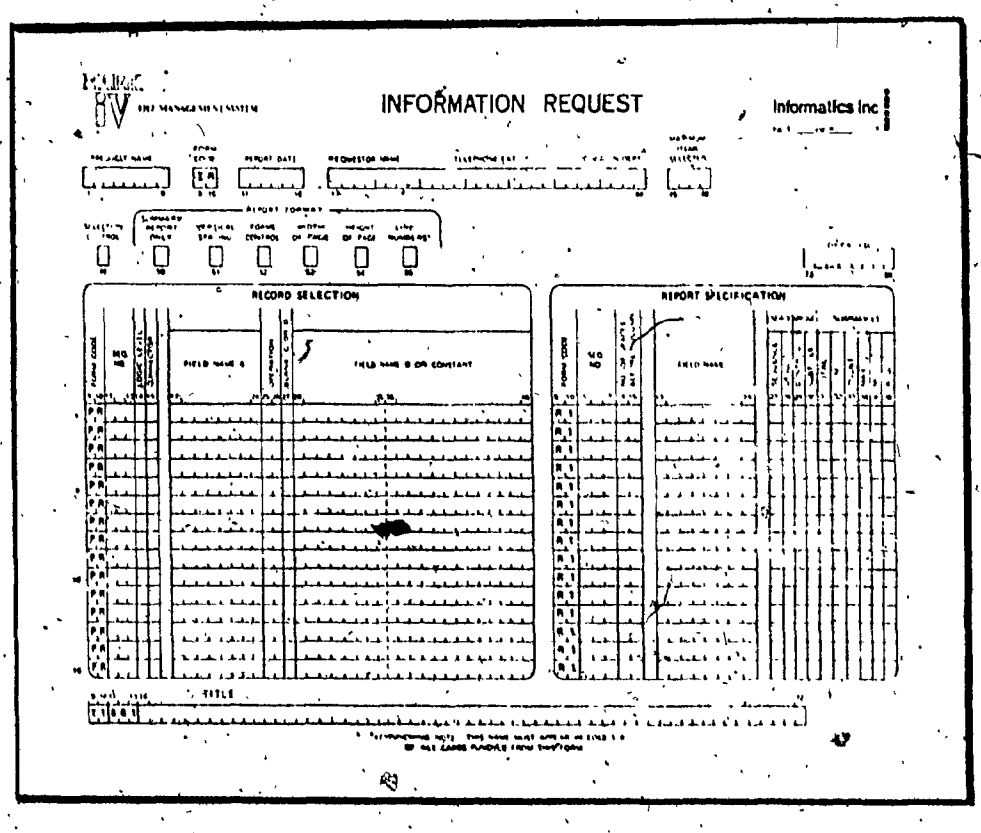


Figure A-1. The Information Request form.

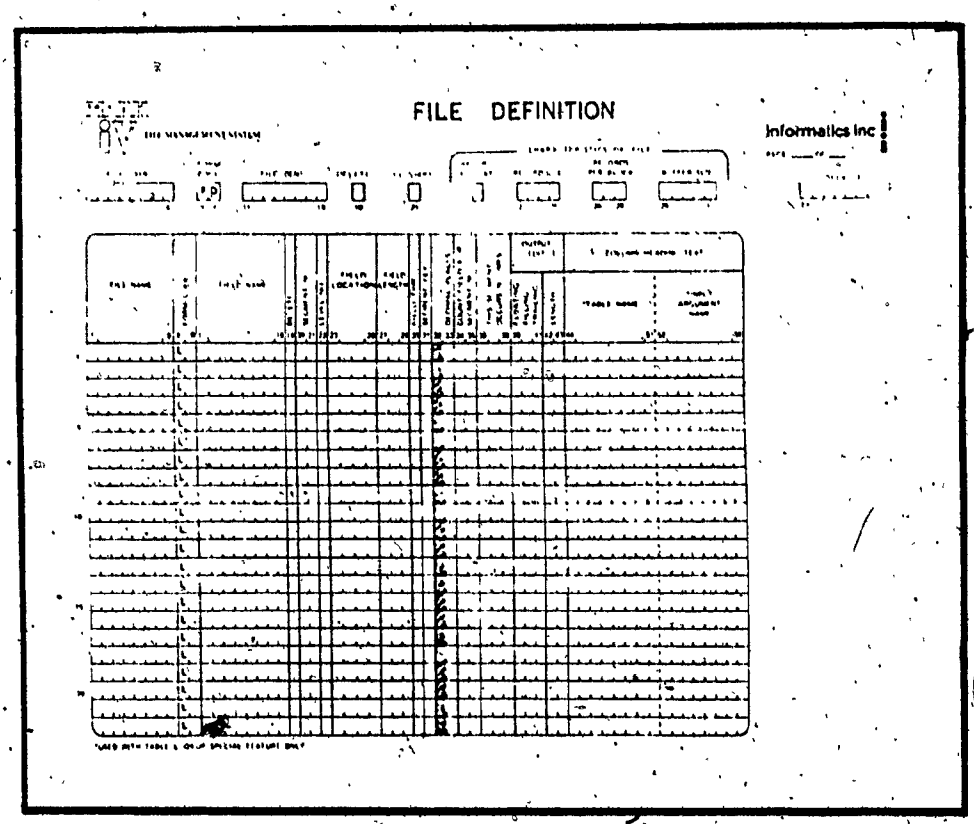


Figure A-42. The File Definition form.

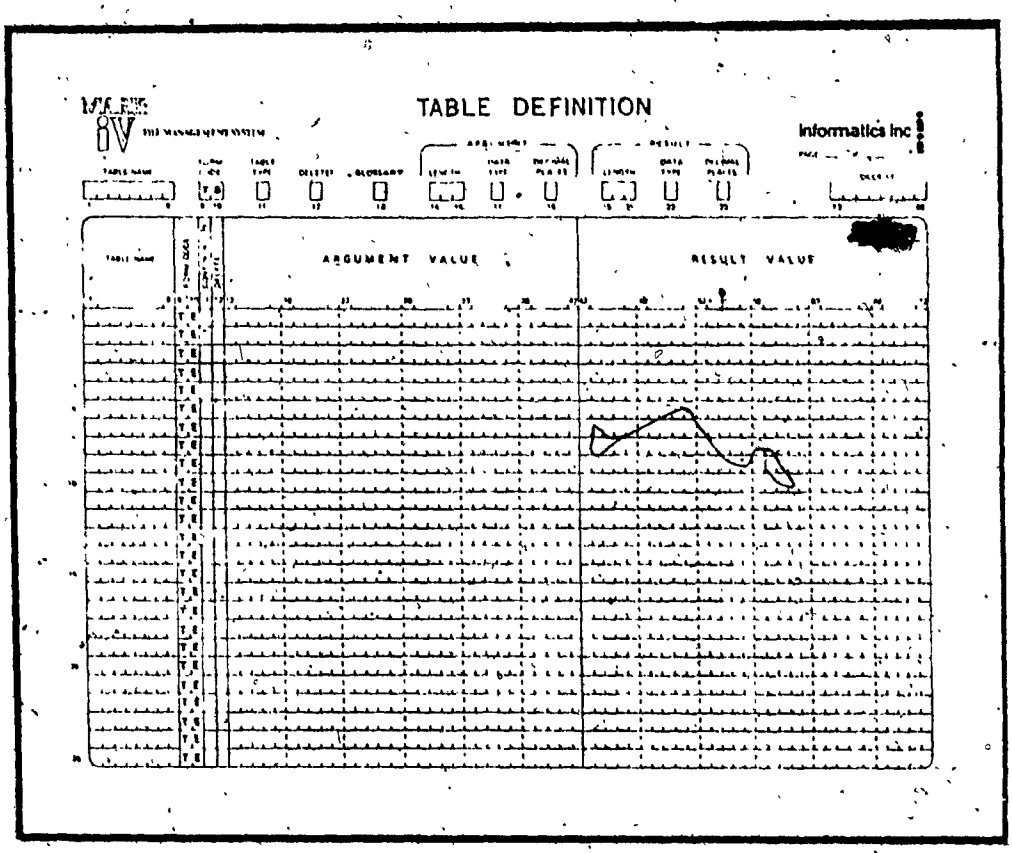


Figure A-3. The Table Definition form.

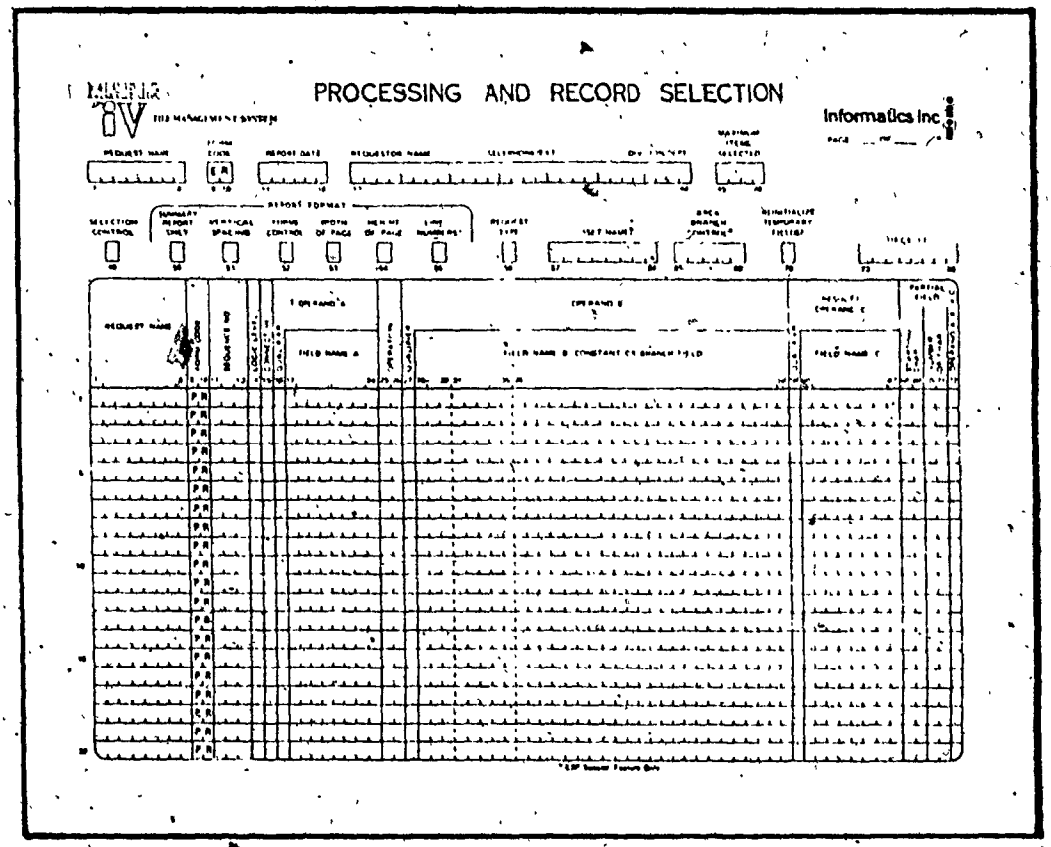


Figure A-4. The Processing and Record Selection form.

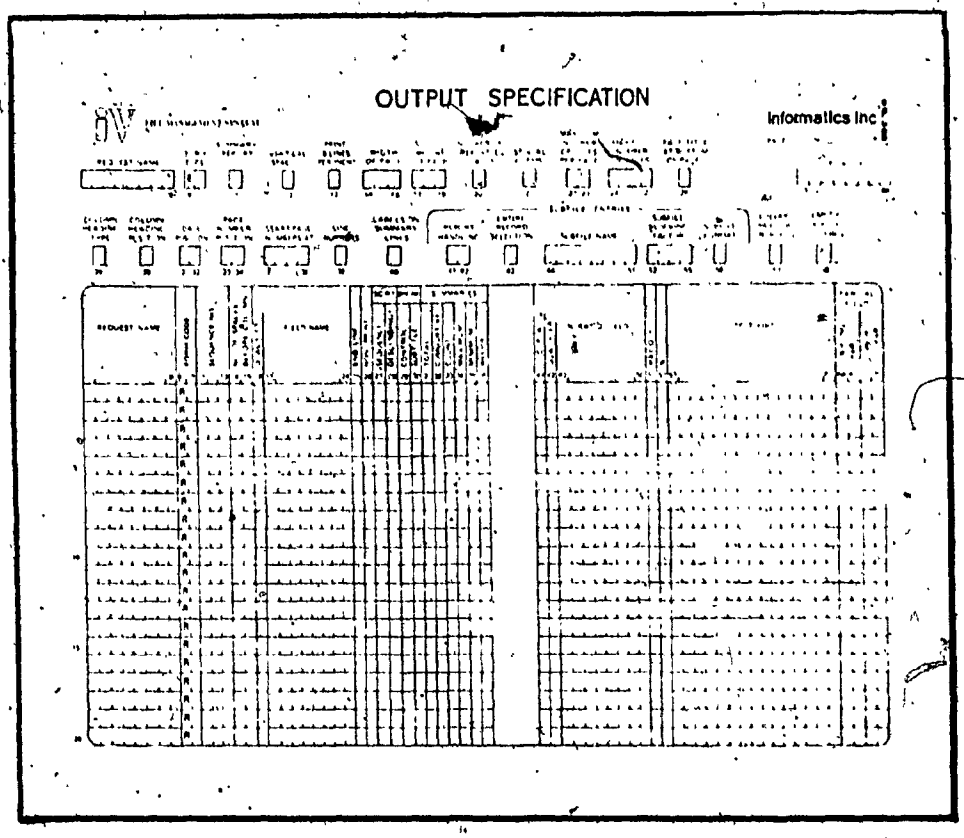


Figure A-5. The Output Specification form.

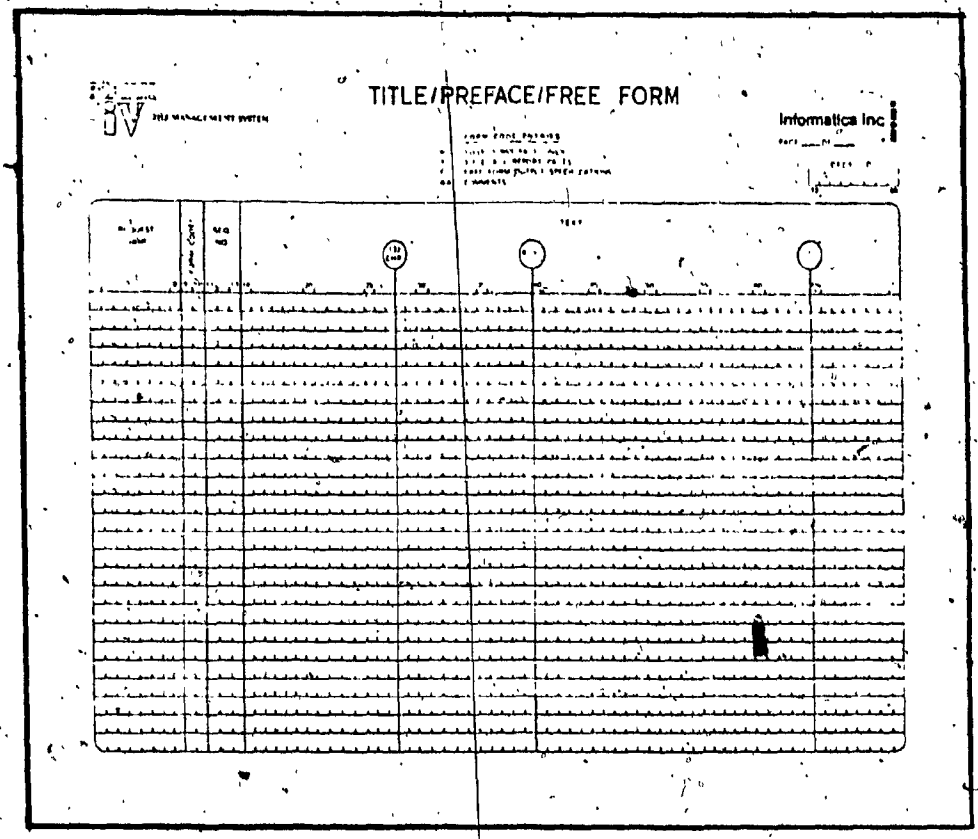


Figure A-6. The Title/Preface/Free Form.

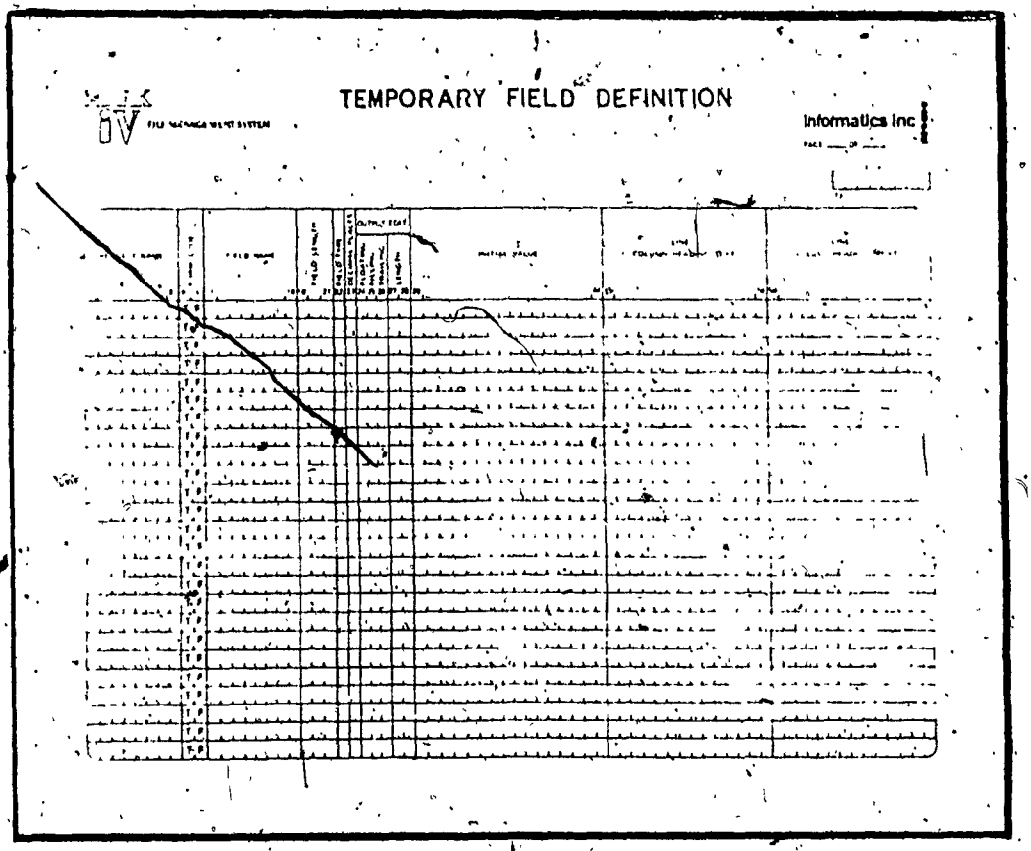


Figure A-7. The Temporary Field Definition form.

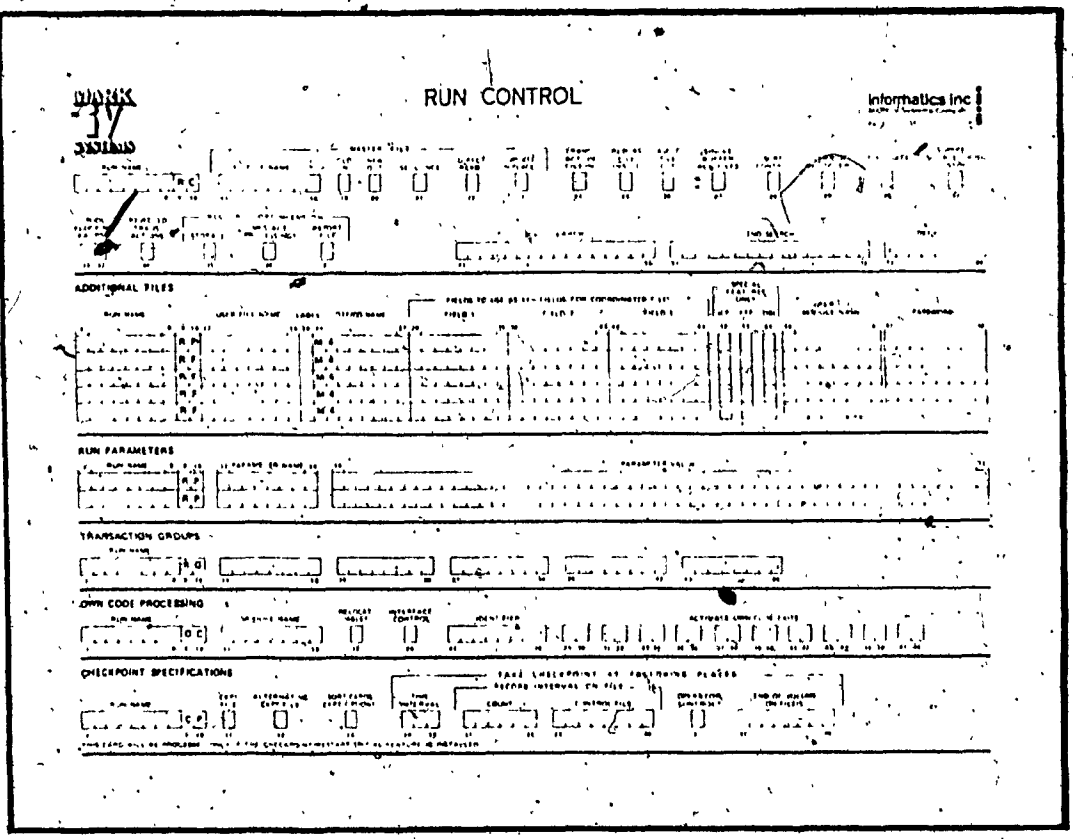


Figure A-8. The Run Control form.

APPENDIX B

Objectives

*Please note- these are worded as they are in the course, from the student's perspective.

Terminal Objectives

At the end of this course, you will be able to use MARK IV to compile and retrieve multiple reports from an existing master file. You will demonstrate your knowledge by completing the course assignment final problem and all intermediate problems. The mastery principle will be utilized- there will be no limit to the number of computer runs you may try. You will have access to all required reference books. Job Control Language (JCL) and data will be supplied by the Education Centre. The final problem will require you to use the following MARK IV coding forms:

Run Control

Temporary Field Definition

Output Specification

Title/Preface/Free Form

Processing and Record Selection

File Definition

Scope

You will not be expected to code your own JCL, apply transactions to the master file, or change the master file, except by modifying the file description for a card-file master.

Prerequisites

You should have completed the course "Computing Systems Fundamentals" (CSF) or its equivalent before attempting to learn MARK IV. You should be familiar with flowcharting or decision table techniques, and should have some grasp of the concept of data base.

If you do not know how to operate a keypunch machine, or to read in a card deck from a remote terminal (RJE), you will be shown, early in the course.

Objectives- Unit One

Goal: To provide a structured overview of what MARK IV is, what it does, and how it is used.

Enabling Objectives: At the end of this unit you should be able to:

1) state what MARK IV is (25 words or less)

2) state what MARK IV does (25 words or less)

3) state how MARK IV is used (25 words or less)

4) identify a File Definition form

5) identify an Information Request form

6) state (25 words or less) the connection between File Definition and Information Request forms

7) define the following terms: field, record, file, sort, input, output, glossary, data base, retrieval language, report, request, delimiter

8) state what CP's system delimiter is and draw it

9) describe (25 words or less) the contents and location of Information Systems' RJE.

You will demonstrate your knowledge by correctly completing a short written test. There will be no time limit, and you may redo the test as many times as you need to, in order to achieve a perfect score.

Objectives- Unit Two

Goal: To explain the various options involved in completing an Information Request form.

Enabling Objectives: At the end of this unit you should be able to:

1) code the IR portion of the form to obtain the desired options, given the required specifications

2) code the PR portion of the form (i.e. select certain records) using the operations EQ, GT, LT, NE, GE, LE, GO, and

NS as required

3) code the R1 portion of the form (i.e. set up a report) using all listed fields as required

4) code the T1 portion of the form (i.e. produce a title)

5) go to the RJE, fill out a keypunch request and retrieve your punched deck, operate a keypunch machine to make your own corrections, read in your job, retrieve your printed output- in short, do whatever is necessary to run your job.

You will demonstrate your knowledge by creating the IR, PR, R1, and T1 cards needed to retrieve four simple reports. You will be provided with the JCL, the data, the file description, the necessary specifications, and assistance for 5) above.

Objectives- Unit Three

Goal: To explain the various options involved in completing a File Definition form.

Enabling Objectives: At the end of this unit you should be able to:

1) code the FD portion of the form to obtain the desired options, given the required specifications

2) code the L0 portion of the form (i.e. define input fields to MARK IV)

3) code the L1-L9 portions of the form (i.e. set up column headers).

You will demonstrate your knowledge by creating the FD, L0, and L1-L9 cards needed to define a file to MARK IV. You will be provided with the JCL and the necessary specifications. You will be expected to run the job, correct any errors, and rerun until it is correct. Assistance will be provided in debugging your program.

Objectives- Unit Four

Goal: To explain the various options involved in completing the following forms: Temporary Field Definition, Output Specification, Title/Preface/Free Form, and Processing and Record Selection.

Enabling Objectives: At the end of this unit you should be able to:

1) code all portions of the above forms as required by the specifications

2) use the arithmetic and R operators on the Processing and Record Selection form

3) use output editing and partial fielding on the Output Specification form.

You will demonstrate your knowledge by coding all the forms required to solve the unit problems, with the exception of the Run Control form. You will be provided with the required JCL, data, and input and output specifications.

Objectives- Unit Five

Goal: To explain the various options relevant to coding the Run Control cards for the course-assignment problems and other, similar problems, and to explain the correct order of assembling a MARK IV job stream deck.

Enabling Objectives: At the end of this unit you should be able to:

1) code the Run Control cards required to execute the report programs coded in Unit Four

2) assemble in the correct order the cards coded in Unit Four, the above Run Control cards, and the given JCL and data cards

3) run the above job, correct any errors, and rerun, until you have produced reports which meet the given specifications

4) state the purpose of a setup sheet (25 words or less).

You will demonstrate your knowledge by providing the Course Advisor with reports which meet the specifications provided.

APPENDIX C

The Student Guide

* Note- Figures C-1 through C-10 are half-size reproductions of the layout forms actually used in the Student Guide.

1. Read PART ONE of the USER'S GUIDE.

2. Work through UNIT ONE of the COURSE. (Slide/tape show)

3. Ask your advisor for the UNIT ONE QUIZ; do it (closed book), and have your advisor correct it.

4. Work through UNIT TWO of the COURSE. (Tapes 2a and 2b)

5. Code and run PROBLEMS 1, 2, 3 and 4. See your advisor for assistance.

6. Work through UNIT THREE of the COURSE. (Tape 3)

7. Code and run PROBLEMS 5 and 6. See your advisor for assistance.

8. Work through UNIT FOUR of the COURSE. (Tape 4)

9. Code and run PROBLEM 7. See your advisor for assistance.

10. Code the FINAL PROBLEM, except for the RUN CONTROL cards.

11. Work through UNIT FIVE of the COURSE. (Tape 5)

12. Code the RUN CONTROL cards required for the FINAL PROBLEM. Assemble in the correct order the given JCL and data, the cards you coded in Step 10 above, and the RUN CONTROL cards. Run the job. See your advisor for assistance.

FIELD NAMES FOR

PROBLEMS 1, 2, 3 AND 4

FIELD NAMES	STANDS FOR	LENGTH
SIN	SOCIAL INSURANCE NUMBER	9
SURNAME	SURNAME	20
INITIALS	INITIALS	2
BIRTHDAY	DATE OF BIRTH	6
BDAY)	BIRTH DAY	2
BMON) redefines	BIRTH MONTH	2
BYEAR)	BIRTH YEAR	2
SERVDATE	START OF SERVICE	6
SERVDAY)	SERVICE DAY	2
SERVMON) redefines	SERVICE MONTH	2
SERVYEAR)	SERVICE YEAR	2
JOBCLASS	JOB CLASS	5 numerics
SEX	M OR F	1

MARK IV - PROBLEM 1

Code the IR, R1 and T1 portions of the Information Request form to produce the following report. Since you will be selecting all records, no PR cards are required. You will be given JCL and data cards. The input file field names you will need are:

SURNAME (20 characters)
BIRTHDAY (6 characters)
SERVDATE (6 characters)

Sort the output on SURNAME.
Your report should look as much as possible like the output requirements.

MARK IV - PROBLEM 2

As you did for Problem 1, produce the following report.

The input file field names are:

JOBCLASS	(5 characters)
SURNAME	(20 characters)
SERVDATE	(6 characters)

Sort the output on JOBCLASS and SERVDATE.

Count totals on employees per service year per jobclass.

Make jobclass a page title and service year a subtitle.

MARK IV - PROBLEM 3

Produce the same report as you did for Problem 1, but use the following selection criteria:

- the date of birth before 1955
  and date of service before 1965.

MARK IV - PROBLEM 4

Produce the same report as you did for Problem 2, but use the following selection criteria:

- class equal to 59002, or
  sex equal to 1.

MARK IV - PROBLEM 5

Attached is a file layout for SIMPFILE. Code the FD, LO and L1-L9 cards needed to define this file to MARK IV. Specifications are as follows:

Ask for Glossary type 'B'

record format Fixed

record size 80

10 records/block

1 segment, 1 level in file

SEG-KEY is the segment key

Report column headings needed are:

NAME

CURRENT SALARY

CITY OF RESIDENCE

HOME PHONE

ZONE NUMBER

OCCUPATION TITLE

WORK LOCATION

WORK PHONE

MARK IV - PROBLEM 6

Attached is a file layout for COMPFILE. Code the FO, LO and L1-L9 cards needed to define this file to MARK IV. Specifications are as follows:

Ask for Glossary type 'B'

Record format Fixed

Record size 80

10 records/block

1 segment, 1 level in file is the segment key

SIN is the segment key

Report column headings needed are:

JOB CODE

IDENTITY NUMBER

CITY

PROVINCE

ADDRESS

SOCIAL INSURANCE NUMBER

TONS OF FREIGHT

DOLLAR VALUE

SHIPPING DATE

MONTH OF SHIPMENT

FREIGHT TYPE

MARK IV - PROBLEM 7

Code all the required cards to solve the following problem. JCL and data will be supplied.

For each record,

Add the contents of values one, two and three giving value four.

Multiply the contents of value four by two giving value five.

Subtract one from value five giving value six.

Sum each column at the end.

Suppress summary labels.

Sort output on ID number and value one.

MARK IV - FINAL PROBLEM

Attached are an input file layout and output specifications for three reports. Your assignment is to code the necessary MARK IV cards which, along with the JCL and data which will be supplied, will produce the requested reports.

You will need the following coding forms:

FILE DEFINITION

PROCESSING AND RECORD SELECTION

OUTPUT SPECIFICATION

TITLE/PREFACE/FREE FORM

TEMPORARY FIELD DEFINITION

RUN CONTROL

SPECIFICATIONS

REPORT A

Selection criteria - select all records

Report specifications

- detail report
- sort on the following fields
    1. ON JCT
    2. OFF JCT
    3. CAR CODE
    4. CONTENT
- provide sub totals on these fields when ON JCT and OFF JCT change.
- fields to be accumulated
    - WEIGHT
    - MILES
    - FREIGHT
    - CP PROPORTION
- provide GRAND totals
- provide summary labels

Report B

Selection criteria - select all records.

Report specifications

- summary report only
- sort on the following fields
    1. ON JCT
    2. OFF JCT
- provide sub totals on these fields when ON JCT and OFF JCT change.
- fields to be accumulated
    WEIGHT
    MILES
    FREIGHT
    CP PROPORTION
- provide GRAND totals
- suppress summary labels

Report C

Selection criteria

- select records originating in Montreal with

  69-GROUP = 52 OR 60.

  AND

  records originating in Toronto with 69-GROUP = 52 OR 70.

- assign commodity descriptions as follows:

  52 = SULPHUR

  60 = ACIDS

  70 = MISC

Report specifications

- detail report
- sort on the following fields
  1. ORIGIN STATION
  2. DESTINATION STATION
  3. COMMODITY DESCRIPTION
- provide sub totals or CP Proportion when the following fields change
  1. ORIGIN STATION
  2. COMMODITY DESCRIPTION

  go to a new page on change of ORIGIN STATION
- suppress summary labels

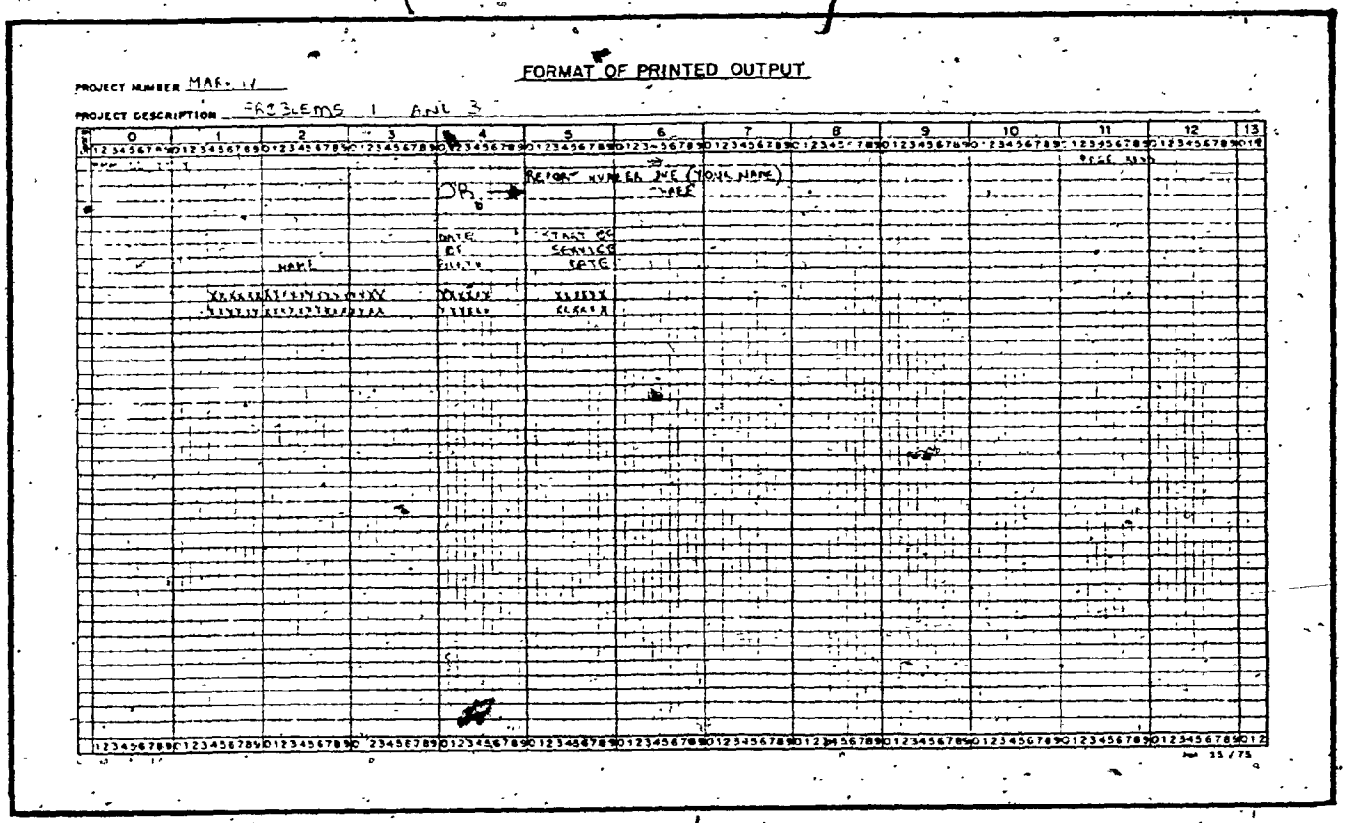


Figure C-1. Output specifications for problems 1 and 3.

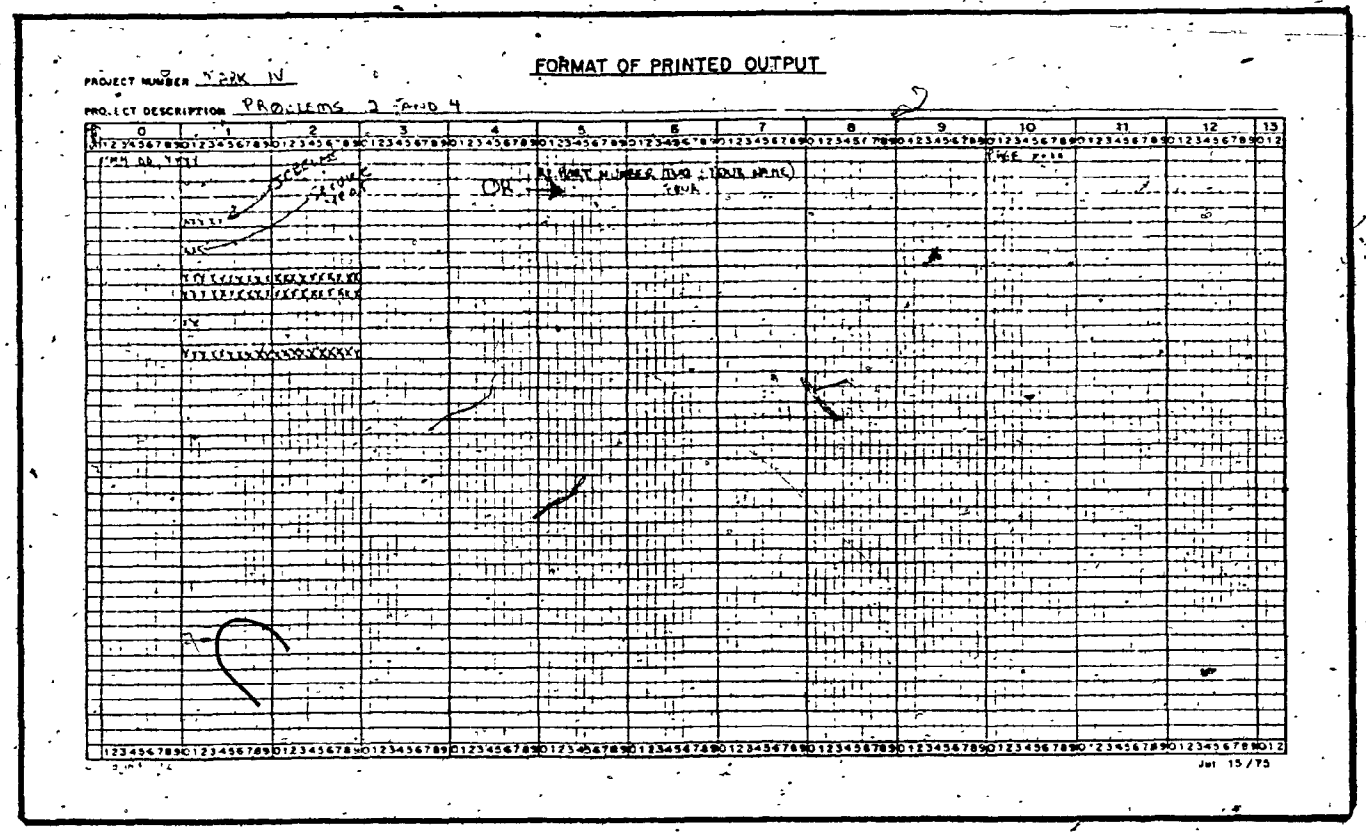


Figure C-2. Output specifications for problems 2 and 4.

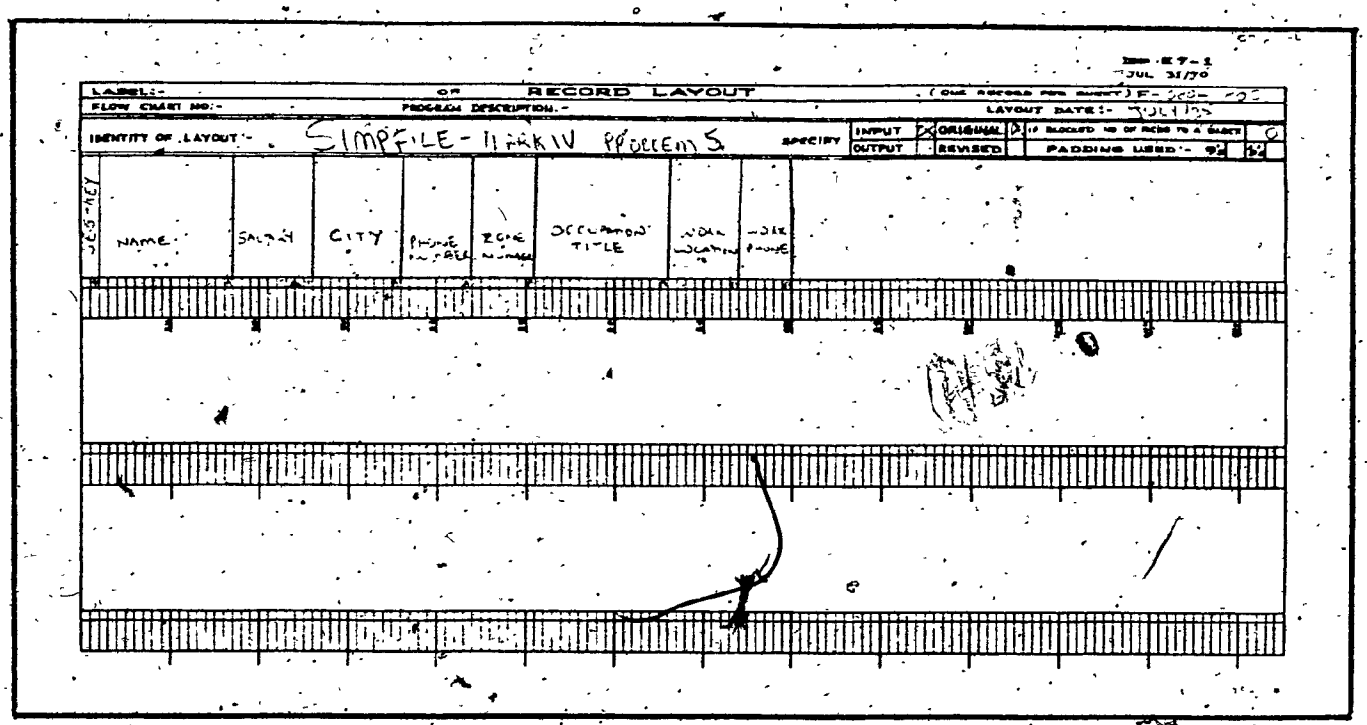


Figure C-3. Record layout for problem 5.

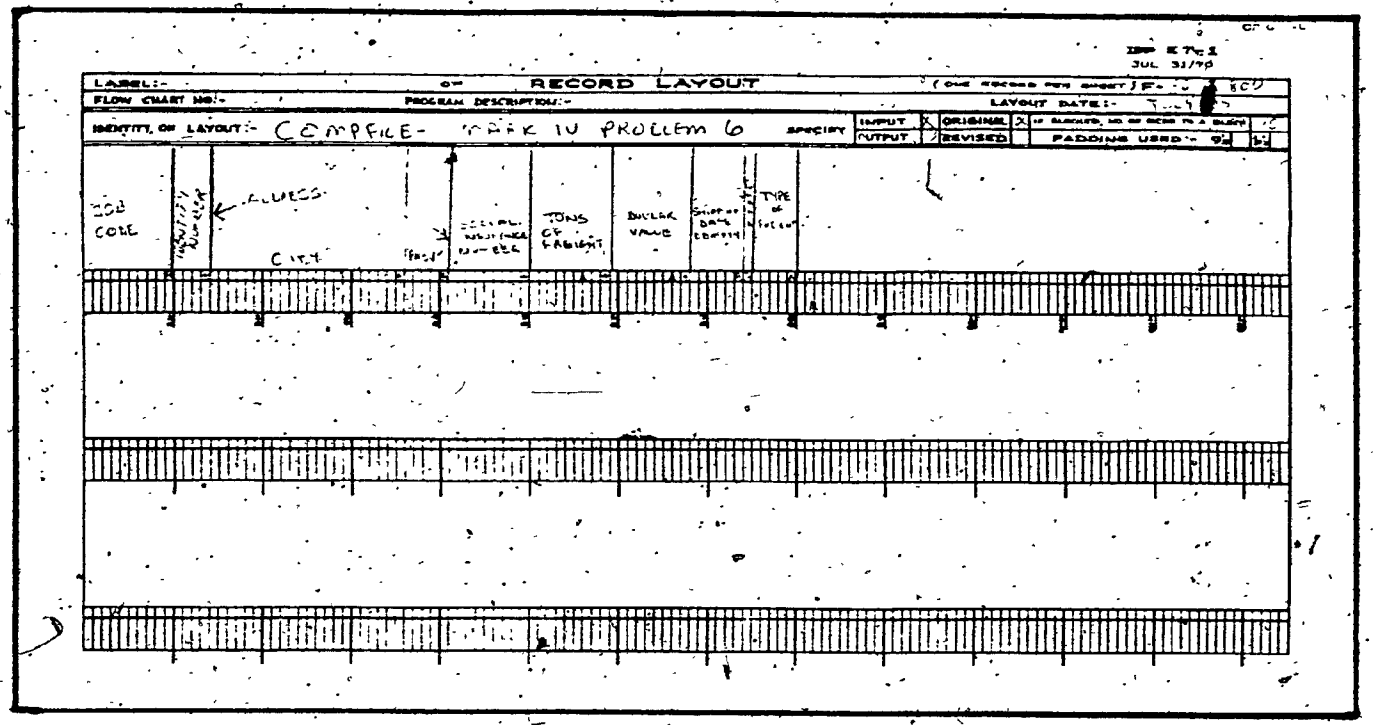


Figure C-4. Record layout for problem 6.

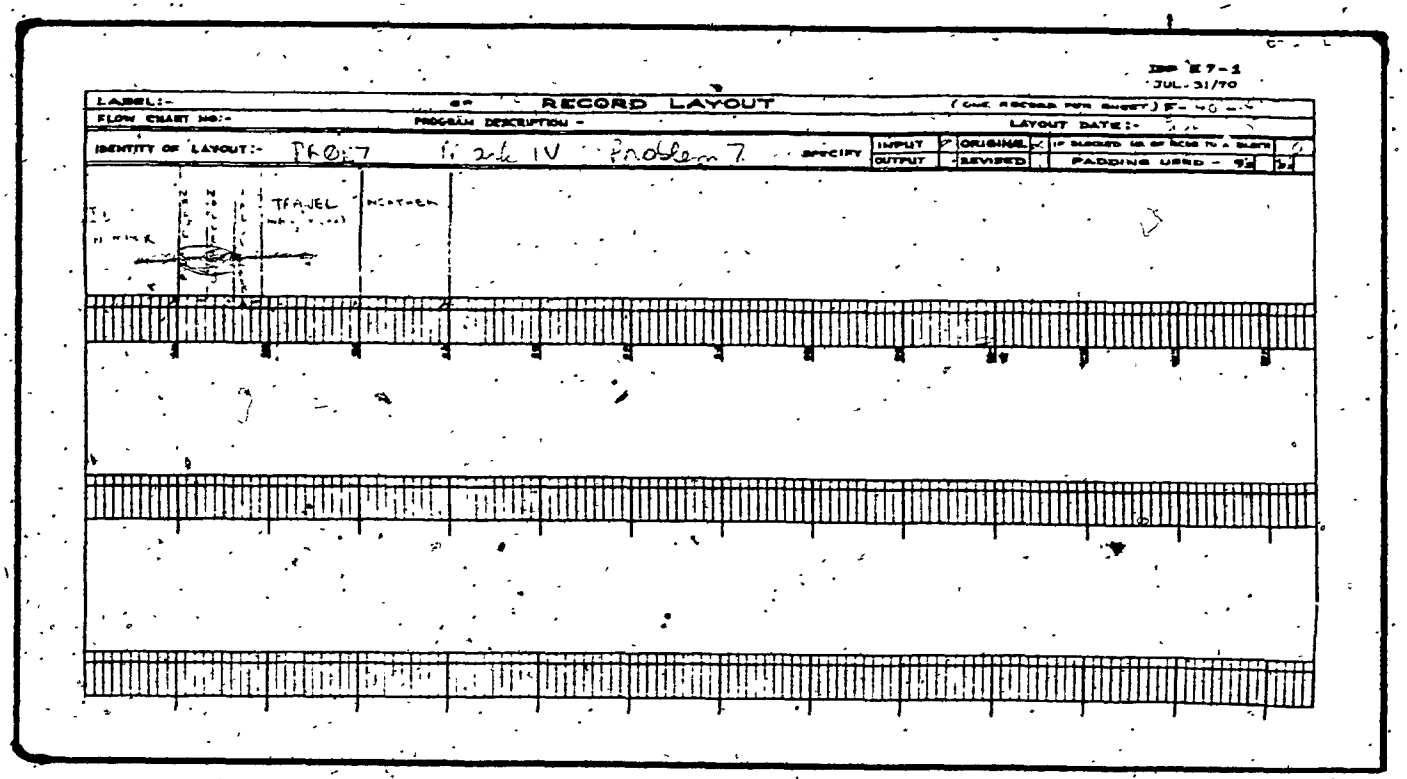


Figure C-5. Record layout for problem 7.

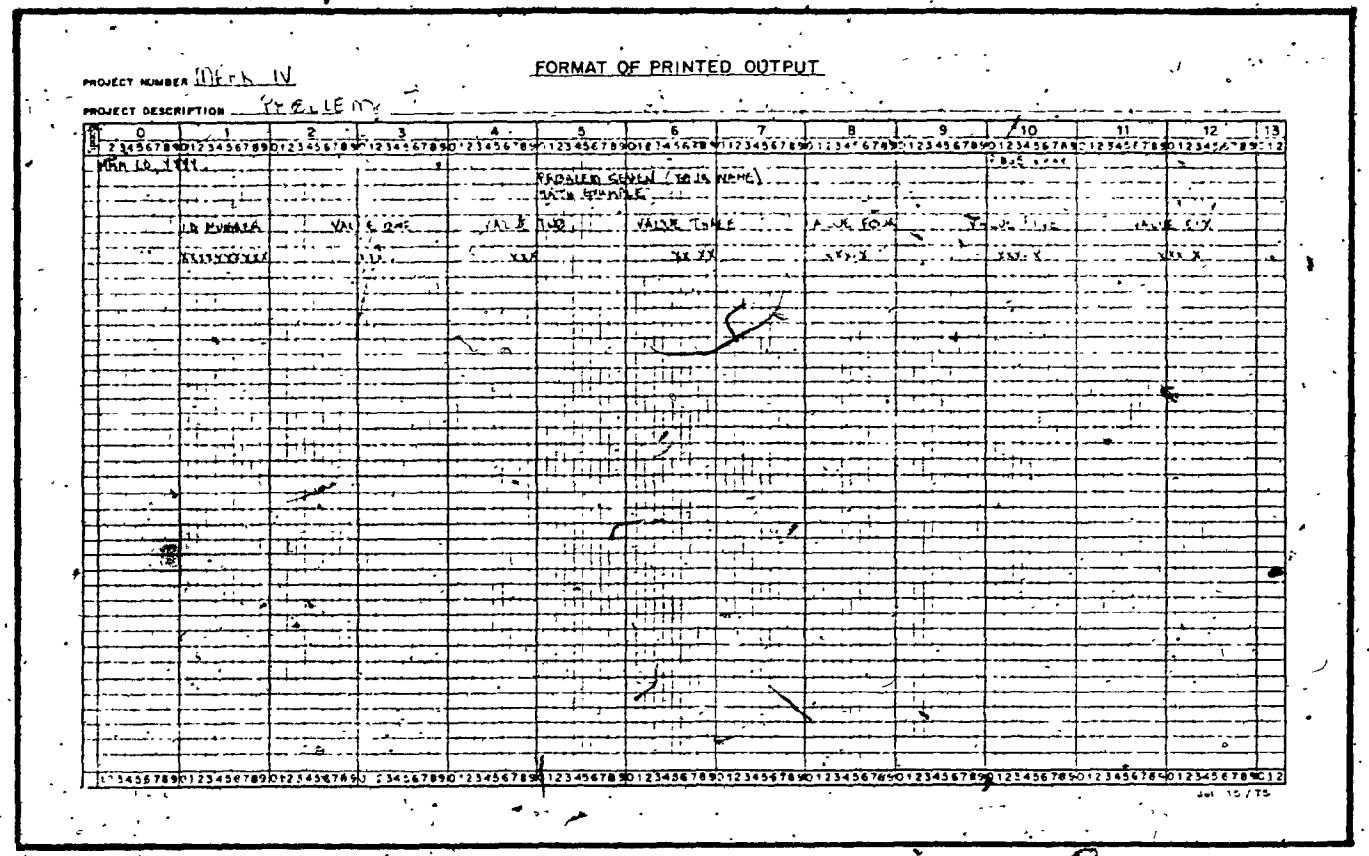


Figure C-6. Output specifications for problem 7.

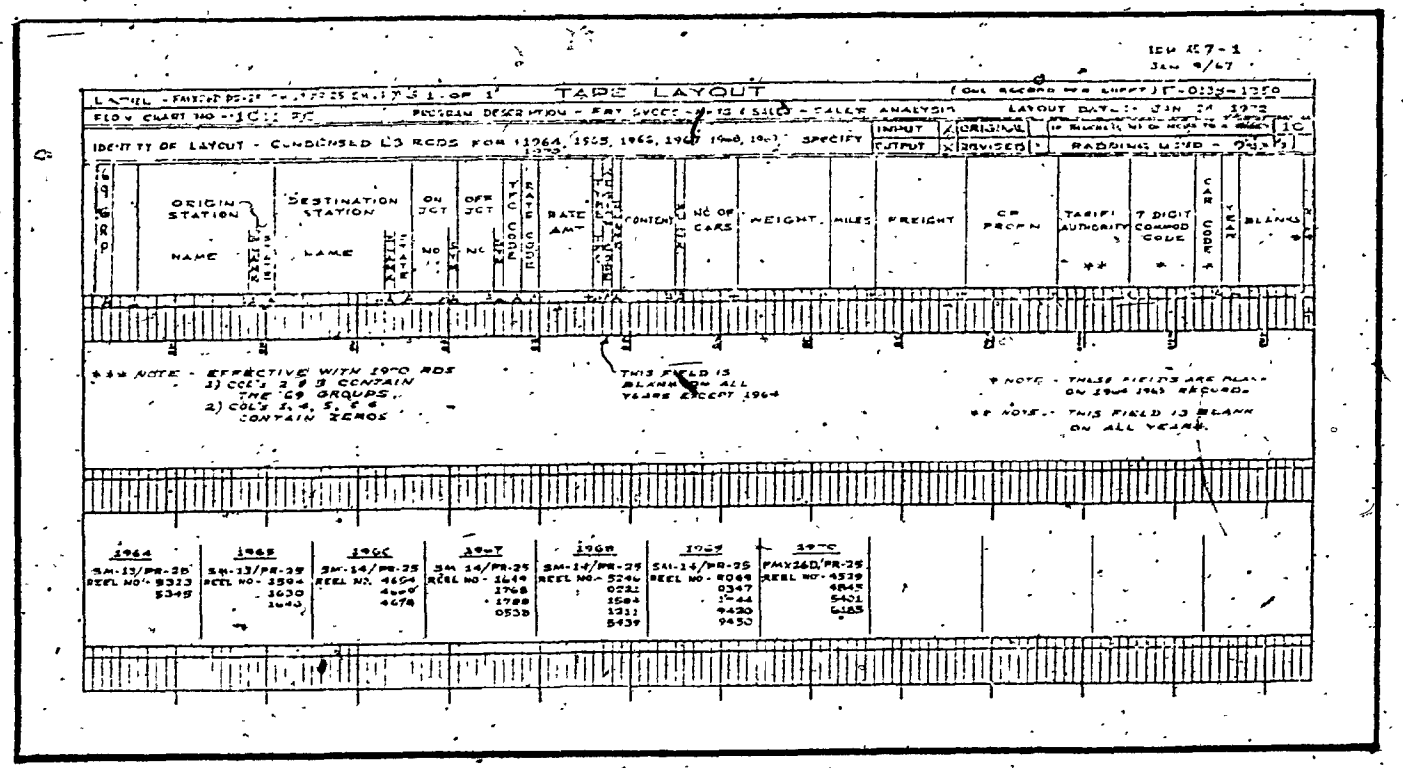


Figure C-7. Record layout for problem 8.

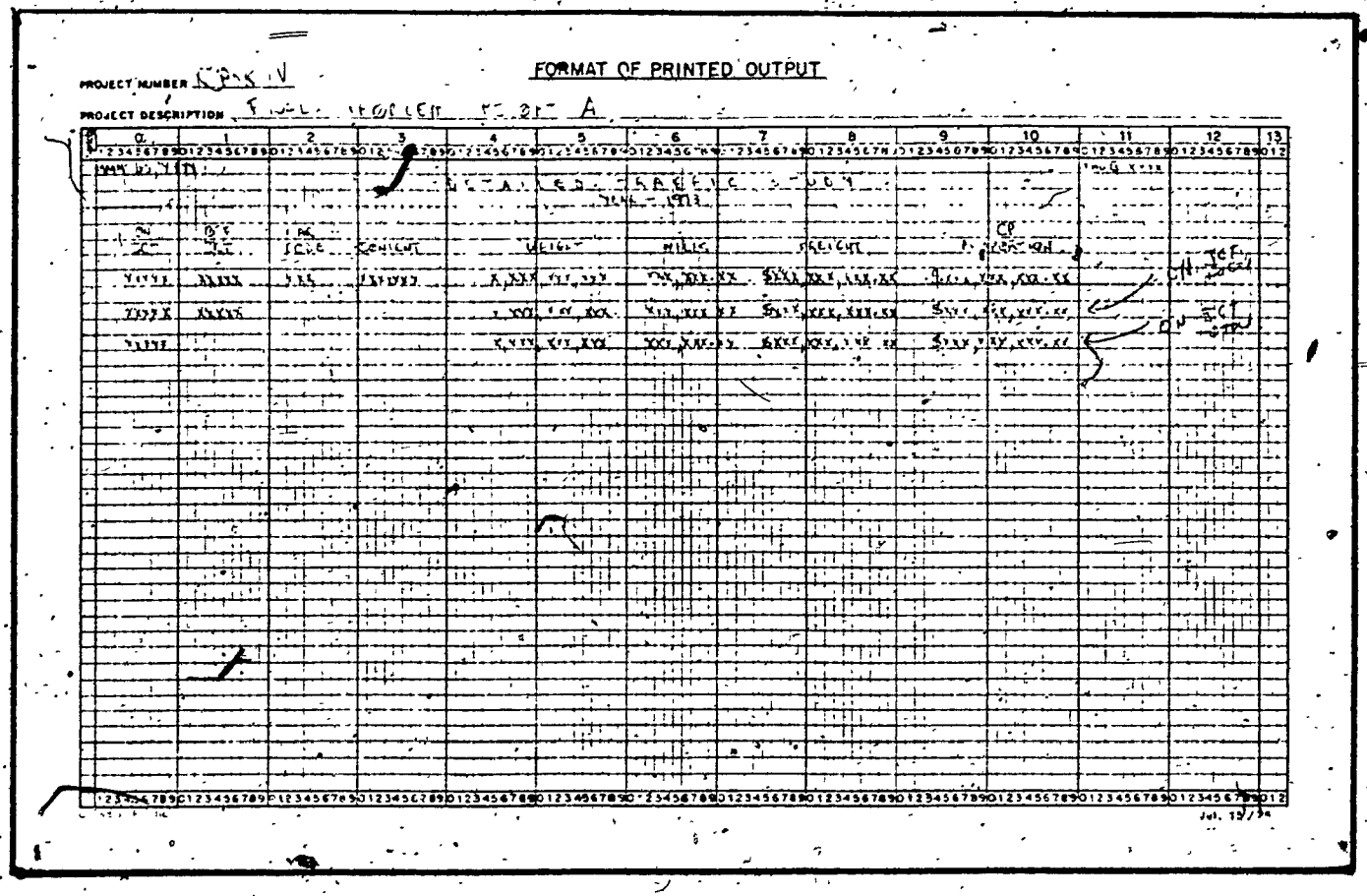


Figure C-8. Output specifications for problem 8-A.

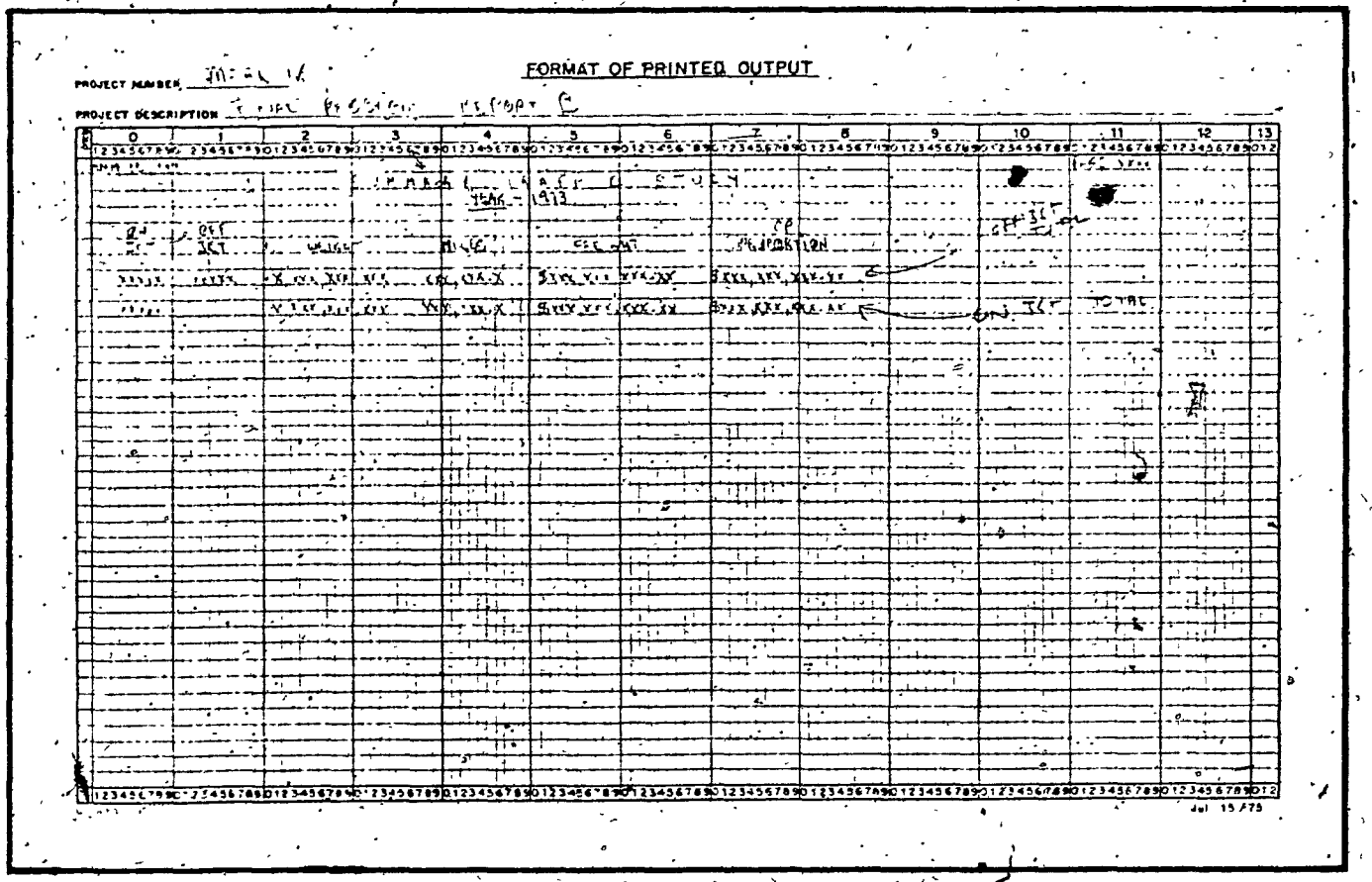


Figure C-9. Output specifications for problem 8-B.

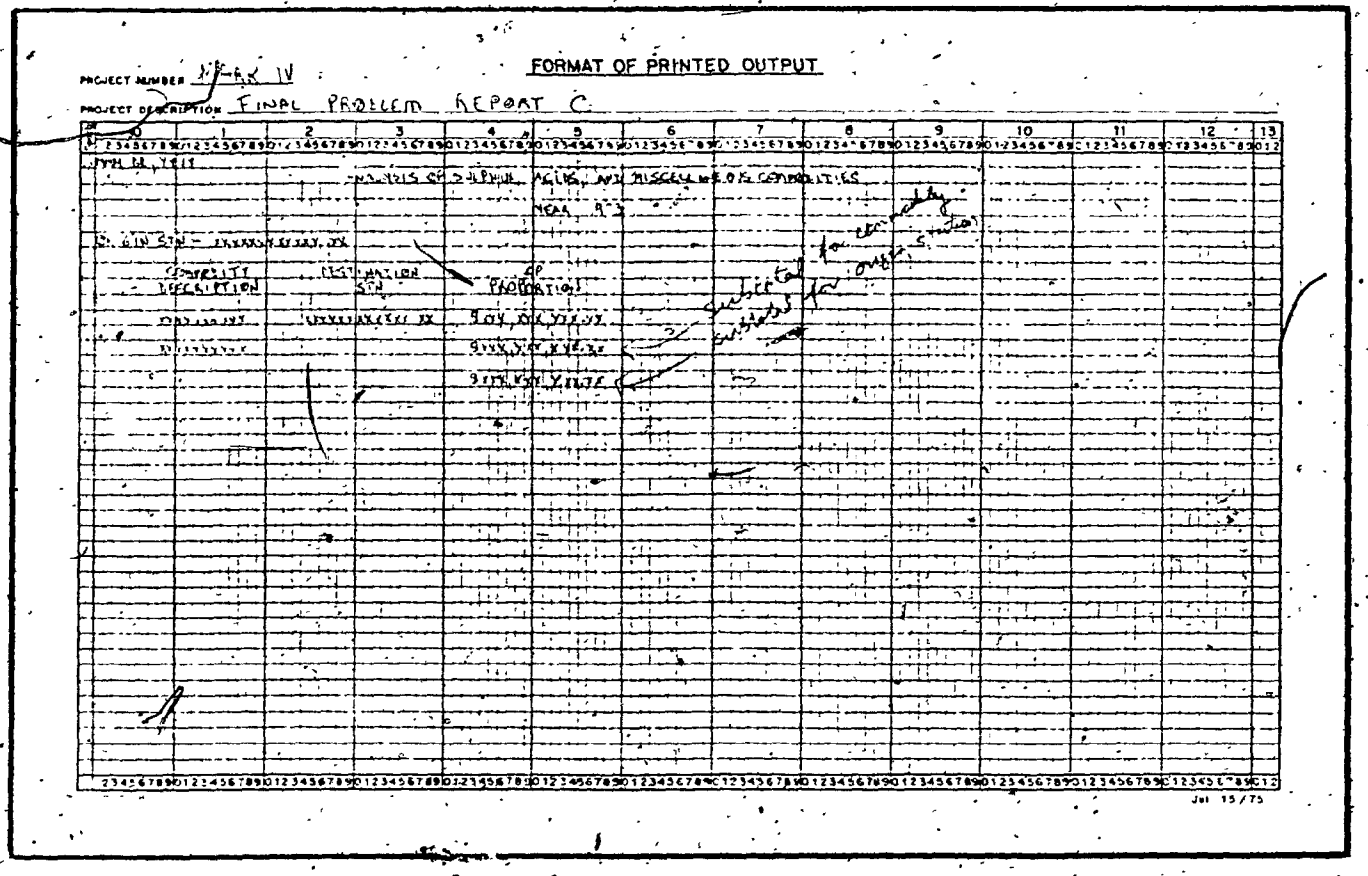


Figure C-10. Output specifications for problem 8-C.

APPENDIX- D

How to View the Module

Caramate Method

The audio tape has been synchronized to automatically rotate the slide tray at the proper intervals, when the Caramate machine is used to view the module. To use the Caramate, the following steps must be performed:

1) Remove the power cord from the storage compartment in the rear of the Caramate and plug it into a grounded wall outlet.

2) Place the loaded slide tray on the Caramate with the notch on the tray rim at "0" opposite the zero pointer.

3) Depress the STOP/EJECT button to open the cassette holder.

4) Place the cassette in the holder and close the holder.

5) Press the POWER button.

6) Press the PLAY button.

7) Adjust the FOCUS and VOLUME as required.

8) If earphones are used, they should be plugged into the EARPHONE JACK, and the volume adjusted through the earphone controls rather than through the Caramate volume control.

Alternate Method

If a Caramate machine is not available, the module may be viewed using an ordinary slide projector and cassette player instead. The slides should be manually advanced as indicated by the four asterisks (****) in the script for the module. (See Appendix E for the script.)

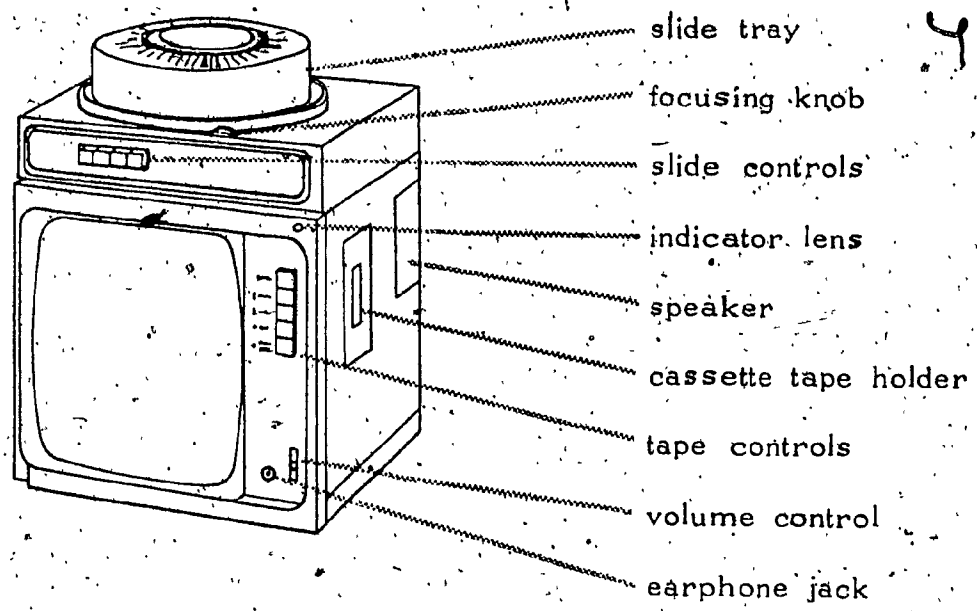


Figure D-1. The Caramate.

APPENDIX E

The Script

slide # 1 (title)
slide # 2 (title)

****Canadian Pacific Information Systems presents...****the MARK IV course for Users. Chapter one- introduction. Welcome to MARK IV.

slide # 3 (title)

****This module is the first in the MARK IV system audio cassette basic education course, and is meant to be an overview of what you'll be learning in the rest of the course.

slide # 4 (title)

****MARK IV is a computer language; like PL/1 and COBOL. Unlike other languages, MARK IV is easy to learn and use, and is especially intended for people who are not data processing specialists. ****MARK IV is also a system, or a collection of related programs existing in the computer's memory. You won't have to know all about the MARK IV system in order to use it. **** What you will learn about the MARK IV language will give you sufficient knowledge to access the MARK IV system.

slide # 5 (title)

slide # 6 (graphic)

slide # 7 (graphic)
slide # 8 (title)

****What are the uses of MARK IV? ****Information retrieval and report writing are two important uses of MARK IV, and by the end of this course, you will be proficient in both. By "information retrieval", we mean obtaining specific information from the computer's memory. We can retrieve information from a file or data base, such as;...****"How many employees within Information Systems are over 41 years of age and have been with the company for less than five years?" ****Or, we might want to know the location of type "X" freight cars between Quebec and Alberta. ****MARK IV will find this information for you, and print it in a report.

slide # 9 (graphic)

slide # 10 (graphic)

slide # 11 (graphic)

slide # 12 (photo of written reports, fanned out)

A report of any kind **** is a written summary of information, and a computer-generated report is exactly that... one or more pages listing information obtained from analyzing a file. A report generally has a title, date, page numbers, and other formatting niceties, and a MARK IV report provides these automatically. ****You'll see how easy it is to get reports like these with MARK IV, as the course progresses.

slide # 13 (photo of computer reports, fanned out)

slide # 14 (title)

****Another important use of MARK IV is file maintenance. "Maintenance", in computer jargon, means "keeping up-to-date". Maintaining a file means changing its content when changes occur in the data. **** You, as a User, will not be maintaining files. This is the responsibility of the Information Systems department.

slide # 15 (title)

slide # 16 (graphic)

****There are a few things you will need to understand about the MARK IV system in order to use it. Here is the overall picture. ****First of all, you must have a file for MARK IV to read. MARK IV calls it the master file. Even if there is only one file involved in your program, MARK IV still calls it the master file.

slide # 17 (title)

slide # 18 (graphic)

****Now, your master file is not necessarily always a master file. Someone else's program may use your file as a subordinate file. Similarly, a subordinate file in one program could be a master file in another. ****For example: File A is used as input to Program XXX, and is the master file. Program XXX produces as output a report, and also another file, called File B. Program YYY reads File B as its input master,

slide # 19 (graphic)

slide # 20 (graphic)

slide # 21 (graphic)

slide # 22 (graphic)

slide # 23 (graphic)

slide # 24 (graphic)

slide # 25 (graphic)

slide # 26 (graphic)

slide # 27 (graphic)

slide # 28 (graphic)

and also reads File A as a subordinate input. The output of Program YYY is three reports. ****A request, in MARK IV terms, is an order to the computer to do something. ****Usually, a MARK IV request produces a report. **** You might request a list of all freight cars over a given size. MARK IV will sort your list in the sequence you specify-from largest to smallest or the other way around, or by location, or by content, or whatever. ****You can have more than one request in your program. A single execution of a MARK IV program can produce many reports. ****MARK IV works this way: It reads your master file into memory, calling it the old master file. At the same time, MARK IV duplicates your master file and stores the duplicate version, which it calls the new master file. ****When your program is executing, it works with the new master file unless you specifically ask for the old master. The new master is deleted at the end of your program. ****So, the first thing MARK IV does is to duplicate your master file and store both versions. Then, it accesses the new master, one record at a time. ****All requests are processed on one record before the next record is accessed. So, if your program contains three requests, they will all be processed on the first record, then all three on the second record, and so on. ****In this way, MARK IV can produce several reports with one reading of the file. -

slide # 29 (graphic)

****In order to use the MARK IV system, you must learn the MARK IV language, and that is what this course is all about.

slide # 30 (photo of all forms, fanned out)

****Programming in MARK IV is accomplished by filling in several preprinted forms. These are then keypunched. When combined with the required JCL, or Job Control Language cards, and data cards, the resulting deck is read**** into the computer. ****Your program, consisting of the cards you created with the MARK IV coding forms, the JCL, and the data, activates the collection of programs and procedures called the MARK IV system.

slide # 31 (photo of cards going thru reader)

slide # 32 (graphic)

slide # 33 (photo of printer printing)

****The results of your program come out on the printer.

slide # 34 (photo of coding forms, fanned out)

****Now let's look at the coding forms. The rest of the course will teach you exactly how to fill them in. This lesson is meant only to introduce them to you. ****The first form you will learn about is the Information Request, or IR form. You will recognize this form by its light blue colour, its title, and the preprinted code IR in columns 9 and 10.

slide # 35 (photo of IR form)

slide # 36 (photo of IR form with sections marked on)

**** The IR form is used to produce simple reports. There are four sections to the form. ****The first part of the Information Request form is where you specify your programming logic, or your selection criteria. Which records do you want included in your report? Which do you not want? ****The second part of the form is where you indicate what you want your report to look like. How far apart do you want your columns? Which fields do you want printed? What kind of totals do you want? In what order do you want your report?

slide # 37 (photo of first part of IR)

slide # 38 (photo of second part of IR)

slide # 39 (photo of third part of IR)

****The third part of the IR form can be left blank if you want your report on standard paper, single spaced, with other standard format options. Or, by filling in this part of the Information Request form, you can get non-standard formatting.

slide # 40 (photo of fourth part of IR)

****The fourth part of the IR form is for your report title.

slide # 41 (photo of PR, Output Specs, and Title forms).

****To produce more complicated reports, the following three forms are substituted for the IR form... The Processing and Record Selection, Output Specifications, and Title/Rreface/Free Form coding forms. These are all light green in colour. ****The Processing and Record Selection form substitutes for the first part of the IR form.

slide # 42 (photo of PR overlaid on first part of IR)

slide # 43 (photo of Output Specs overlaid on second part of IR)

****The Output Specifications form substitutes for the second part of the IR form. ****The Title/Preface/Free Form takes the place of the title portion of the Information Request form, and allows you to have more than one line of title for your report.

slide # 44 (photo of Title overlaid on title part of IR)

slide # 45 (photo of FD form)

****Before you can ask for a retrieval from a file, that file must be defined to MARK IV. This is done by coding the File Definition form. The File Definition form is bright yellow in colour, and has the preprinted code FD in columns 9 and 10. ****The File Definition form, in addition to describing the length, field type, and starting position of every field you need from a file, sets up column headings. ****When you ask for a particular field to be printed, the column heading from the file definition is printed as well. When you run a file definition in MARK IV, your computer output includes **** a glossary of that file.

slide # 46 (photo of FD form with column headings filled in).

slide # 47 (photo of IR and FD forms)

slide # 48 (photo of glossary).

This is a list of information about the file you just defined, in an easily-read format. ****Another form that you will be using is the Temporary Field Definition, or TF form. The TF form is light green, and has the letters TF printed in columns 9 and 10.

slide # 49 (photo of TF form)

slide # 50 (graphic)

****A temporary field is one which exists for the duration of your job, in the computer's memory, but which does not exist on any file.

slide # 51 (graphic)

****You might use a temporary field to store a value which will change during your program, and which you want to examine at intervals. For example, you might want to set a switch, and later, do one of two things, depending on the value of the switch at that point. ****Or, a temporary field might be used to hold the result of a calculation.

slide # 52 (graphic)

slide # 53 (photo of RC form)

****The last MARK IV form which will be discussed in this course is the Run Control form. It is white, and has the letters RC in columns 9 and 10. The Run Control form is the bridge between the MARK IV language and the MARK IV system.

slide # 54 (photo of other forms)

****There are other MARK IV coding forms, but they will not be discussed in this course. If you need to use any of them, your advisor will refer you to the required material in the Reference Manual or the advanced course. ****During this course, you will be learning how to use the forms, individually and in combination.

slide # 55 (photo of forms used in this course)

slide # 56 (graphic)

****You may be wondering about the word "automatic", used several times in this discussion. ****MARK IV has several default options. By coding a box or two- or by leaving certain boxes blank- you cause MARK IV to perform a standard function for you.

slide # 57 (title)

slide # 58 (title)

slide # 59 (graphic)

slide # 60 (graphic)

slide # 61 (photo of messages)

slide # 62 (graphic)

slide # 63 (photo of outside of RJE)

slide # 64 (photo of keypunch machine)

slide # 65 (photo of reader and printer)

slide # 66 (graphic)

slide # 67 (photo of text)

****Besides saving coding time, this also reduces the possibility of making a specification error on one of the forms. ****If you have never programmed before, you may be worried about making a mistake when writing your programs. What is the worst that couls happen if you do something wrong? ****If you use the card decks provided with the course, you cannot cause any damage to the computer or to other peoples' programs. The only harm you can cause by coding something wrong, or by reading your deck in upside down, or by assembling your cards in the wrong order, is to trigger diagnostic messages. ****Diagnostic messages are of several types, ranging from information to critical. There are over 600 of these messages, and in all cases, they are self-explanatory and allow for easy correction of the problem. If you get any, find the problem, fix it, and try again. You may try as many times as you need to in this course.

A few other facts which you should know before programming in this installation. ****First of all, the CP system delimiter is the pound sign. ****Secondly, the RJE, or Remote Job Entry, is in a room on "B" floor, near the coffee machine. ****It contains keypunch machines, a card reader, and a printer.**** The computer itself is located elsewhere. When you are ready to run your first job, your advisor will take you to the RJE and show you how to work the equipment.

****A word now about the course you are following...the materials you will be using are: ****Six audio cassettes and accompanying text;

slide # 68 (photo of Student Guide)

****a student guide, which lists your progression through the course and also includes the specifications for the programs you will be coding and running on the computer;

slide # 69 (photo of Reference Manual)

****a Reference Manual,

slide # 70 (photo of User's Guide

****and a User's Guide.

slide # 71 (photo of Operations Guide, Special Features Manual, and Pracniques Handbook)

****Three other books are available if you need them, but are not part of this basic course. They are the Operations Guide, the Special Features Manual, and the Pracniques Handbook.

****This concludes the introduction to the MARK IV course for Users.

slide # 72 (graphic)

slide # 73 (graphic)

****Please turn off the machine now, and ask your advisor for the quiz.

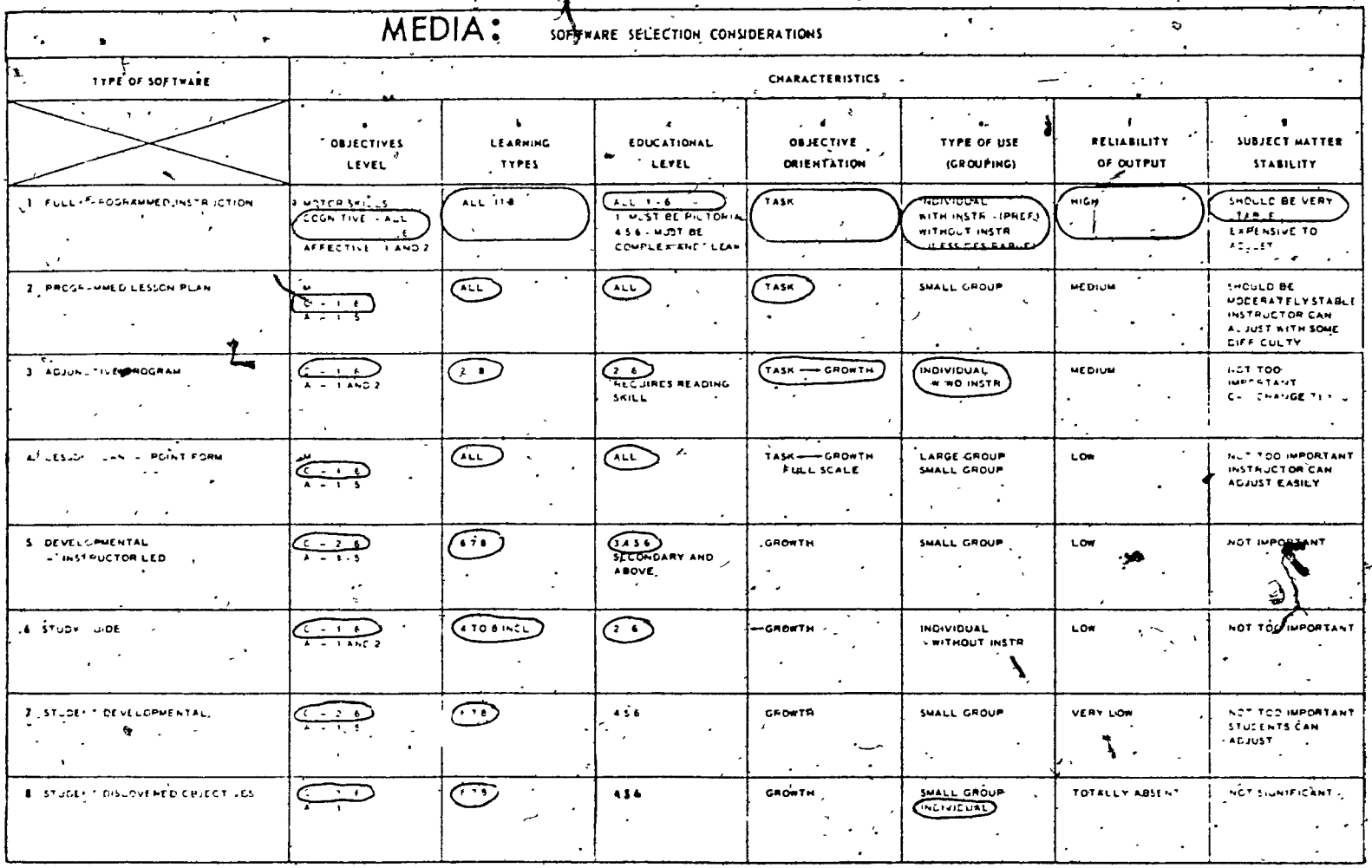
(slide tray rotates a few more times)

****

APPENDIX F

Software and Hardware Considerations

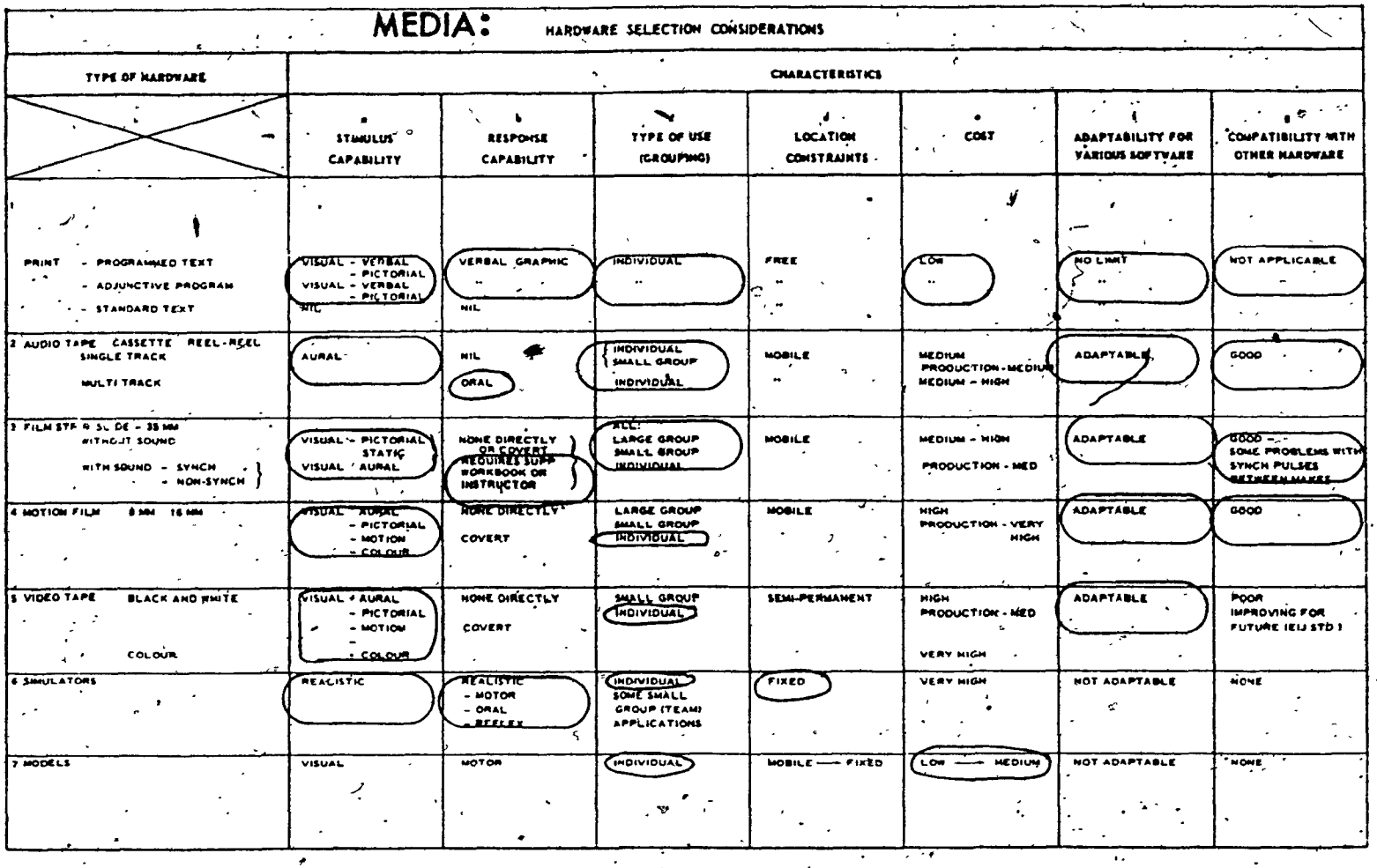
* Note- Figures F-1 and F-2 are actually three-quarter-size reproductions of Holden's charts.



MEDIA: SOFTWARE SELECTION CONSIDERATIONS

TYPE OF SOFTWARE	CHARACTERISTICS						
	a OBJECTIVES LEVEL	b LEARNING TYPES	c EDUCATIONAL LEVEL	d OBJECTIVE ORIENTATION	e TYPE OF USE (GROUPING)	f RELIABILITY OF OUTPUT	g SUBJECT MATTER STABILITY
1 FULL PROGRAMMED INSTRUCTION	3 MOTOR SKILLS COGNITIVE - ALL AFFECTIVE 1 AND 2	ALL 1-8	ALL 1-6 1 MUST BE PICTORIAL 4 5 6 - MUST BE COMPLEX AND CLEAR	TASK	INDIVIDUAL WITH INSTR - (PREF) WITHOUT INSTR (LESS EFFICIENT)	HIGH	SHOULD BE VERY STABLE EXPENSIVE TO ADJUST
2 PROGRAMMED LESSON PLAN	M C - 1 6 A - 1 5	ALL	ALL	TASK	SMALL GROUP	MEDIUM	SHOULD BE MODERATELY STABLE INSTRUCTOR CAN ADJUST WITH SOME DIFFICULTY
3 ADJUNCTIVE PROGRAM	C - 1 6 A - 1 AND 2	2 8	2 6 REQUIRES READING SKILL	TASK — GROWTH	INDIVIDUAL W/O INSTR	MEDIUM	NOT TOO IMPORTANT C- CHANGE IT
4 LESSON PLAN - POINT FORM	M C - 1 6 A - 1 5	ALL	ALL	TASK — GROWTH FULL SCALE	LARGE GROUP SMALL GROUP	LOW	NOT TOO IMPORTANT INSTRUCTOR CAN ADJUST EASILY
5 DEVELOPMENTAL - INSTRUCTOR LED	C - 2 6 A - 1 5	6 7 8	3 4 5 6 SECONDARY AND ABOVE	GROWTH	SMALL GROUP	LOW	NOT IMPORTANT
6 STUDY GUIDE	C - 1 6 A - 1 AND 2	4 TO 8 INCL	2 6	GROWTH	INDIVIDUAL WITHOUT INSTR	LOW	NOT TOO IMPORTANT
7 STUDENT DEVELOPMENTAL	C - 2 6 A - 1 5	1 7 8	4 5 6	GROWTH	SMALL GROUP	VERY LOW	NOT TOO IMPORTANT STUDENTS CAN ADJUST
8 STUDENT DISCOVERED OBJECTIVES	C - 1 1 A - 1	1 7 8	4 5 6	GROWTH	SMALL GROUP INDIVIDUAL	TOTALLY ABSENT	NOT SIGNIFICANT

Figure F-1. Software selection considerations worksheet. (Holden, 1973.)



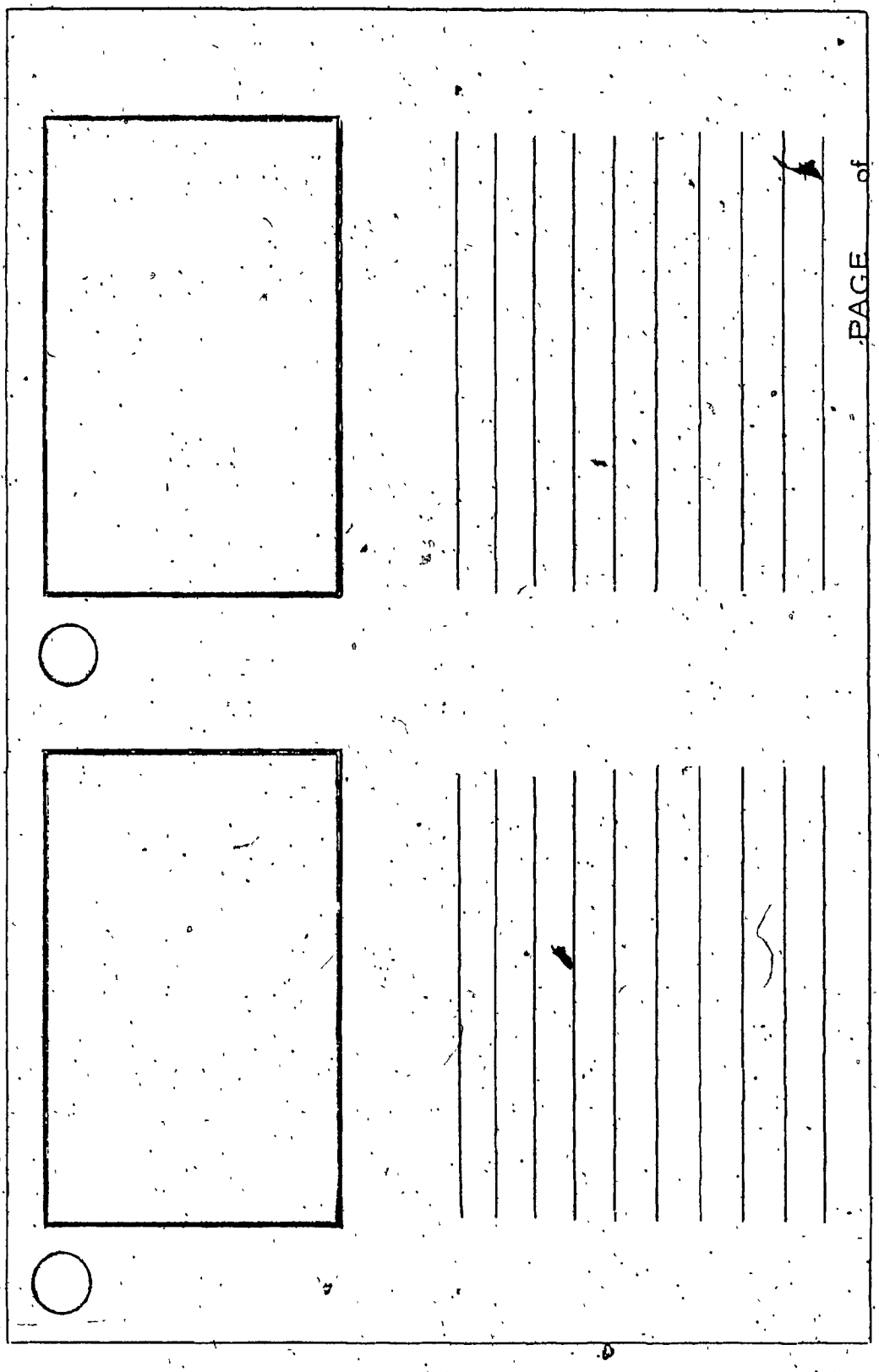
MEDIA: HARDWARE SELECTION CONSIDERATIONS

TYPE OF HARDWARE	CHARACTERISTICS						
	STIMULUS CAPABILITY	RESPONSE CAPABILITY	TYPE OF USE (GROUPING)	LOCATION CONSTRAINTS	COST	ADAPTABILITY FOR VARIOUS SOFTWARE	COMPATIBILITY WITH OTHER HARDWARE
1 PRINT - PROGRAMMED TEXT - ADJUNCTIVE PROGRAM - STANDARD TEXT	VISUAL - VERBAL - PICTORIAL VISUAL - VERBAL - PICTORIAL NIL	VERBAL GRAPHIC " NIL	INDIVIDUAL "	FREE " "	LOW "	NO LIMIT "	NOT APPLICABLE "
2 AUDIO TAPE CASSETTE REEL-REEL SINGLE TRACK MULTI TRACK	AURAL	NIL ORAL	INDIVIDUAL SMALL GROUP INDIVIDUAL	MOBILE "	MEDIUM PRODUCTION - MEDIUM MEDIUM - HIGH	ADAPTABLE	GOOD
3 FILM STRIP & SLIDE - 35 MM WITHOUT SOUND WITH SOUND - SYNCH - NON-SYNCH	VISUAL - PICTORIAL STATIC VISUAL AURAL	NONE DIRECTLY OR COVERT REQUIRES SUPP WORKBOOK OR INSTRUCTOR	ALL LARGE GROUP SMALL GROUP INDIVIDUAL	MOBILE	MEDIUM - HIGH PRODUCTION - MED	ADAPTABLE	GOOD - SOME PROBLEMS WITH SYNCH PULSES BETWEEN MAKES
4 MOTION FILM 8 MM 16 MM	VISUAL AURAL - PICTORIAL - MOTION - COLOUR	NONE DIRECTLY COVERT	LARGE GROUP SMALL GROUP INDIVIDUAL	MOBILE	HIGH PRODUCTION - VERY HIGH	ADAPTABLE	GOOD
5 VIDEO TAPE BLACK AND WHITE COLOUR	VISUAL + AURAL - PICTORIAL - MOTION - - COLOUR	NONE DIRECTLY COVERT	SMALL GROUP INDIVIDUAL	SEMI-PERMANENT	HIGH PRODUCTION - MED VERY HIGH	ADAPTABLE	POOR IMPROVING FOR FUTURE (EIA STD)
6 SIMULATORS	REALISTIC	REALISTIC - MOTOR - ORAL - REFLEX	INDIVIDUAL SOME SMALL GROUP (TEAM) APPLICATIONS	FIXED	VERY HIGH	NOT ADAPTABLE	NONE
7 MODELS	VISUAL	MOTOR	INDIVIDUAL	MOBILE — FIXED	LOW — MEDIUM	NOT ADAPTABLE	NONE

Figure F-2. Hardware selection considerations worksheet. (Holden, 1973.)

APPENDIX G

A Sample of the Script Form


PAGE of

APPENDIX H$_5$

Introductory Unit Criterion Test: Treatment Group One

Name_____

MARK IV QUIZ ON UNIT ONE: INTRODUCTION

Answer the following questions in 25 words or less for each.

1) What is MARK IV?_____

2) What does MARK IV do?(i.e. what is its purpose?)_____

3) How is MARK IV used?_____

4) What distinguishes a File Definition form from other forms?_____

5) What distinguishes an Information Request form from other forms?_____

6) What is the connection between File Definition and Information Request forms?_____

7) Briefly define the following terms:

Field_____

Record_____

File_____

Sort

Input

Output

Glossary

Data base

Retrieval language

Report

Request

Delimiter

8) What is the system delimiter at CP and how is it used?

9) Where is the RJE used by Information Systems and what is in it?

APPENDIX I

Introductory Unit Criterion Test:

Treatment Groups Two and Three

Name_____

MARK IV QUIZ ON UNIT ONE: INTRODUCTION

Answer the following questions in 25 words or less for each.

1) What is MARK IV?_____

2) What does MARK IV do? (i.e. what is its purpose?)

3) How is MARK IV used?_____

4) What distinguishes a File Definition form from other forms?

5) What distinguishes an Information Request form from other forms?_____

6) What is the connection between File Definition and Information Request forms?_____

7) Briefly define the following terms:

Field_____

Record_____

File_____

Sort

Input

Output

Glossary

Data base

Retrieval language

Report

Request

Delimiter

8) What is the system delimiter at CP and how is it used?

9) Where is the RJE used by Information Systems and what is in it?

ABOUT THE SLIDE/TAPE SHOW:

1.) Did the order of topics make sense?

2) What order would have been better?

3) Would you have understood the material just as well without the slides?

4) Would you have understood the material just as well if it had been presented to you as reading material instead?

5) What is your overall impression of MARK IV at this point?

6) How confident are you about your ability to learn MARK IV? (Mark an "X" in one circle.)

- ◯ I am sure I can handle it
- ◯ I probably can handle it
- ◯ HELP!!!

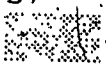
APPENDIX J

Tabulation of Introductory Unit Criterion Test Results

Item by Item

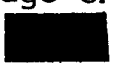
The item analysis consists of histograms of scores on each item. KR_{21} reliability was .70.

KEY: Group One (reading, old audio tape, quiz) is represented by CC 

Group Two (reading, slide/tape, quiz) is represented by E1 

Group Three (slide/tape, quiz, reading) is represented by E2 

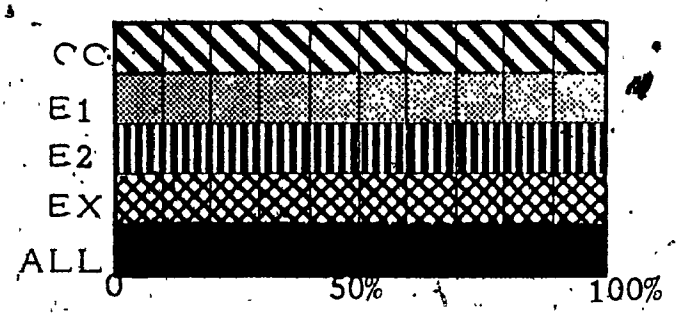
Evaluators are represented by EX 

The average of all four groups is represented by ALL 

The lines represent the percentage of respondents in each group who answered the item correctly.

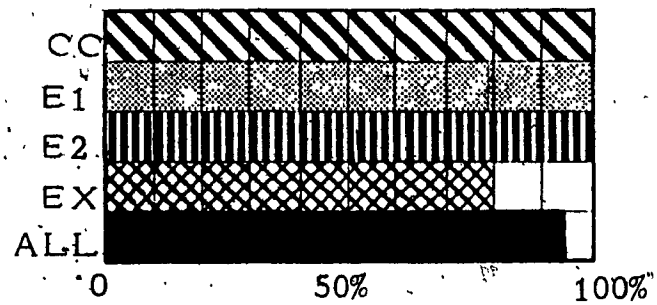
Question # 1

What is MARK IV?



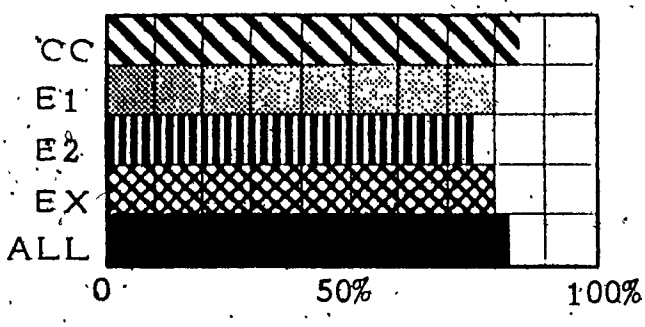
Question # 2

What does MARK IV do?



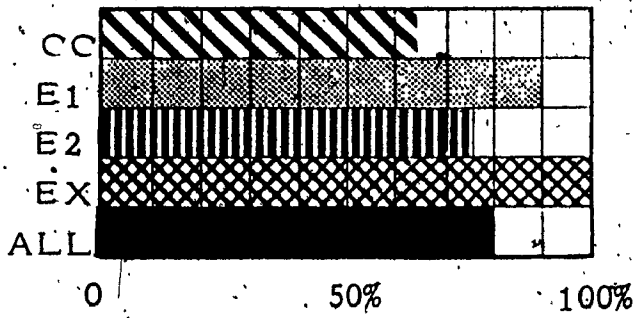
Question # 3

How is MARK IV used?



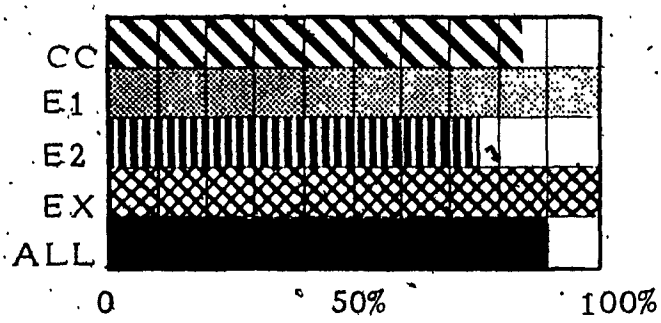
Question # 4

What distinguishes a File Definition form from other forms?



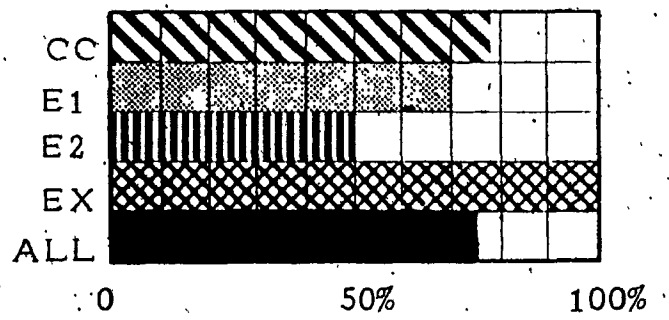
Question # 5

What distinguishes an Information Request form from other forms?



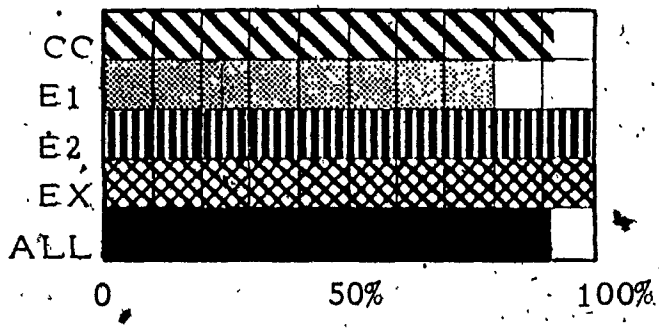
Question # 6

What is the connection between File Definition and Information Request forms?



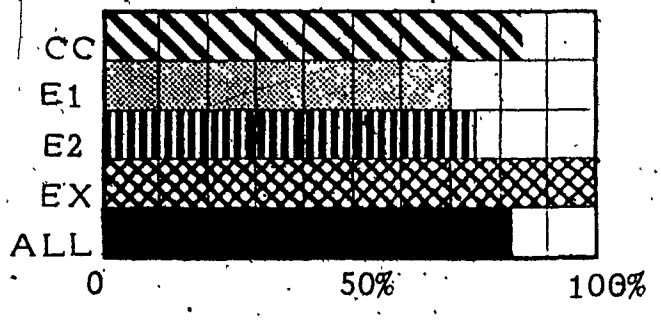
Question # 7a

Define "field".



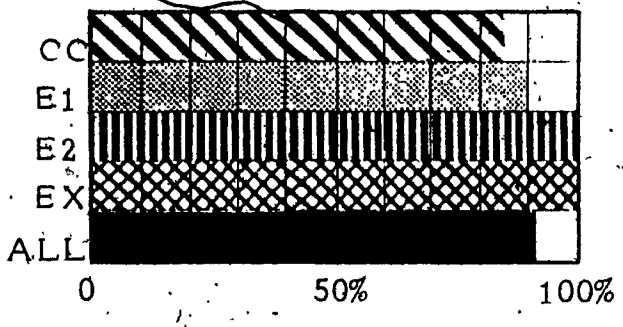
Question # 7b

Define "record".



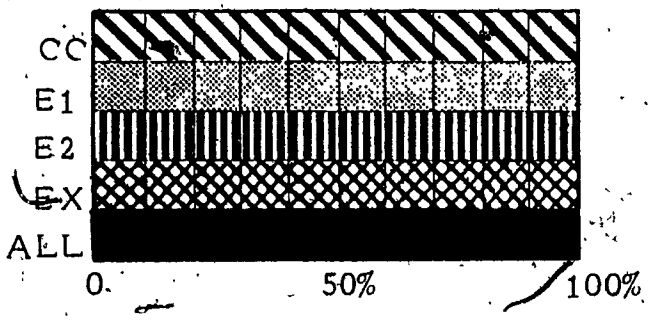
Question # 7c

Define "file".



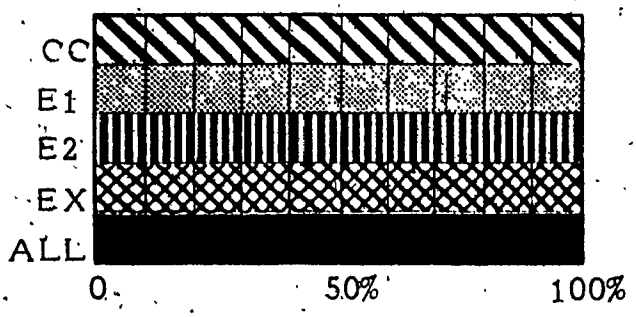
Question # 7d

Define "sort".



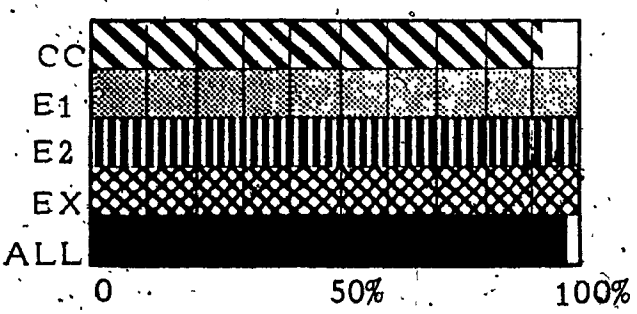
Question # 7e

Define "input".



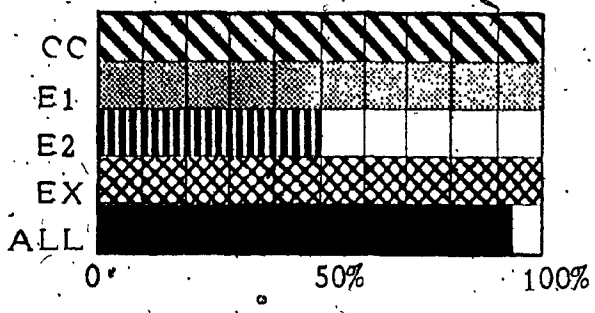
Question # 7f

Define "output".



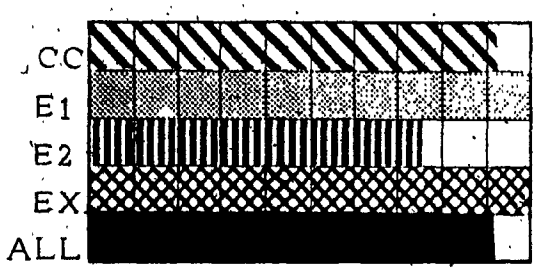
Question # 7g

Define "glossary".



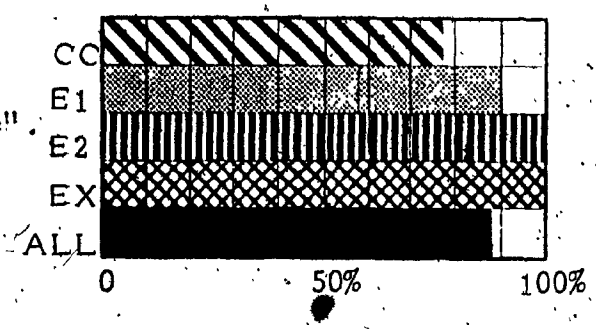
Question # 7h

Define "data base".



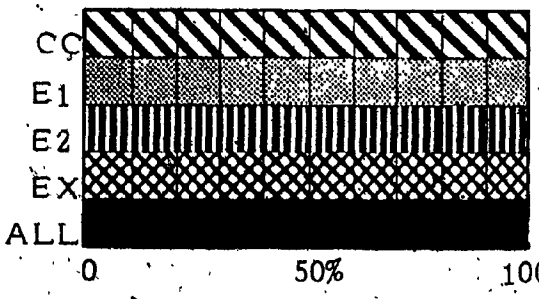
Question # 7i

Define "retrieval language".



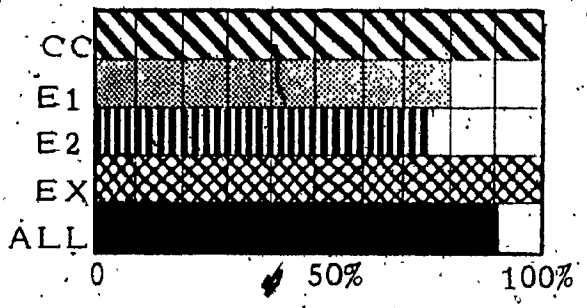
Question # 7j

Define "report".



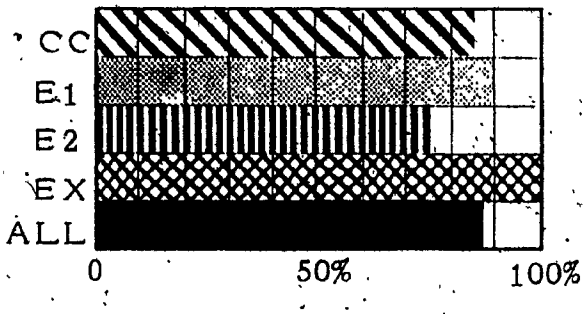
Question # 7k

Define "request".



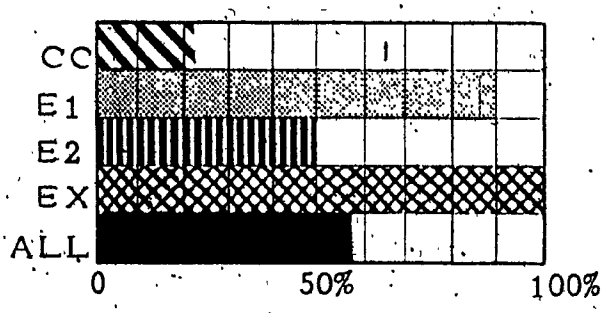
Question # 7l

Define "delimiter".



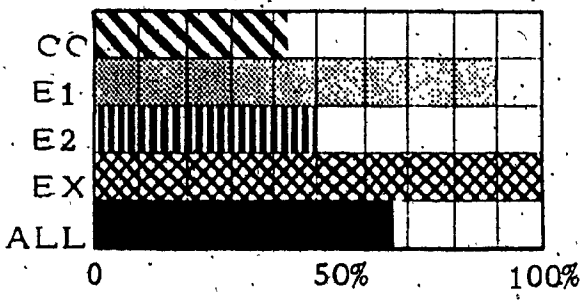
Question # 8

What is the system delimiter at CP and how is it used?



Question # 9

Where is the RJE used by Information Systems and what is in it?



APPENDIX K

Students' Scores on Evaluative Measures

Alphabetically by Group

GROUP ONE N = 14 (Reading, old audio tape, quiz)

Name	Grade on IBM Aptitude Test	Score on CSF (/50)	Percent Correct	Score on CSF Key (/17)	Percent Correct	Score on MARK IV Criterion Test (/20)	Percent Correct
C1						18	90
C2						18	90
C3		43	86	12	70	18	90
C4						16	80
C5						19	95
C6	B+					18	90
C7	B	46	92	15	88	13	65
C8		45	90	15	88	15	75
C9		48	96	15	88	20	100
C10	C	43	86	13	76	13	65
C11	A	48	96	15	88	12	60
C12						19	95
C13		44	88	13	76	20	100
C14						18	90
MAXIMUM		48	96	15	88	20	100
MINIMUM		43	86	12	70	12	60
AVERAGE		45	90	14	82	16	84
STANDARD DEVIATION		1.98		1.19		2.58	

GROUP TWO N = 10 (reading, slide/tape show, quiz)

Name	Grade on IBM Aptitude Test	Score on CSF (/50)	Percent Correct	Score on CSF Key (/17)	Percent Correct	Score on MARK IV Criterion Test (/20)	Percent Correct
E1-1						19	95
E1-2		35	70	10	58	14	70
E1-3		44	88	15	88	12	60
E1-4						16	80
E1-5		46	92	14	82	19	95
E1-6		43	86	13	76	20	100
E1-7						19	95
E1-8						19	95
E1-9						19	95
E1-10		46	92	14	82	18	90
MAXIMUM		46	92	15	88	20	100
MINIMUM		35	70	10	58	12	60
AVERAGE		42	85	13	77	17	87
STANDARD DEVIATION		4.07		1.72		2.50	

GROUP THREE N = 4 (slide/tape show, quiz, reading)

Name	Grade on IBM Aptitude Test	Score on CSF (/50)	Percent Correct	Score on CSF Key (/17)	Percent Correct	Score on MARK IV Criterion Test (/20)	Percent Correct
E2-1						18	90
E2-2						17	85
E2-3	C+	41	82	13	76	16	80
E2-4		42	84	14	82	11	55
MAXIMUM		42	84	14	82	18	90
MINIMUM		41	82	13	76	11	55
AVERAGE		41	83	13	79	15	77
STANDARD DEVIATION		N/A		N/A		2.69	

EVALUATORS N = 5

Name	Grade on IBM Aptitude Test	Score on CSF (/50)	Percent Correct	Score on CSF Key (/17)	Percent Correct	Score on MARK IV Criterion Test (/20)	Percent Correct
EX-1						20	100
EX-2						20	100
EX-3						20	100
EX-4						20	100
EX-5						18	90
MAXIMUM						20	100
MINIMUM						18	90
AVERAGE						19	98
STANDARD DEVIATION						0.80	

OTHERS N = 54

Name	Grade on IBM Aptitude Test	Score on CSF (/50)	Percent Correct	Score on CSF Key (/17)	Percent Correct	Score on MARK IV Criterion Test (/20)	Percent Correct
O-1	A+						
O-2		45	90	13	76		
O-3		46	92	15	88		
O-4	C						
O-5		44	88	14	82		
O-6	C						
O-7		45	90	15	88		
O-8	D						
O-9	B+						
O-10	D						
O-11	A						
O-12	C						
O-13	B	41	82	15	88		
O-14	B	46	92	14	82		
O-15		41	82	9	52		
O-16	D						
O-17		43	86	12	70		
O-18	C+						
O-19		47	94	16	94		
O-20	C						
O-21		47	94	16	94		
O-22	C	41	82	12	70		
O-23	C+						
O-24		43	86	14	82		
O-25	C+						
O-26		47	94	15	88		

OTHERS (continued)

Name	Grade on IBM Aptitude Test	Score on CSF (/50)	Percent Correct	Score on CSF Key (/17)	Percent Correct	Score on MARK IV Criterion Test (/20)	Percent Correct
O-27		38	76	10	58		
O-28		43	86	14	82		
O-29	B+						
O-30	C+						
O-31		47	94	15	88		
O-32	C						
O-33	B+	49	98	16	94		
O-34	C+						
O-35	D						
O-36		41	82	13	76		
O-37		39	78	15	88		
O-38		41	82	12	70		
O-39		41	82	12	70		
O-40	C						
O-41		46	92	13	76		
O-42		49	98	16	94		
O-43		43	86	14	82		
O-44	A+						
O-45		43	86	15	88		
O-46		34	68	8	47		
O-47	A						
O-48		47	94	15	88		
O-49	C	43	86	15	88		
O-50	B+	46	92	16	94		
O-51		49	98	16	94		
O-52	B						

OTHERS (continued)

Name	Grade on IBM Aptitude Test	Score on CSF (/50)	Percent Correct	Score on CSF Key (/17)	Percent Correct	Score on MARK IV Criterion Test (/20)	Percent Correct
O-53	C+						?
O-54	A						
MAXIMUM		49	98	16	94		
MINIMUM		34	68	8	47		
AVERAGE		43	87	13	81		
STANDARD DEVIATION		3.45		2.07		N/A	

APPENDIX L

Course Evaluation Form and Letter

COURSE EVALUATION

TO: Ferne Posternak
Education Centre
Room E-21, 'A' Floor
Windsor Station

FROM: _____

1. DID YOU COMPLETE THE COURSE? ☐ YES ☐ NO. IF NOT, WHY NOT?
   - ☐ SUDDEN CHANGE IN WORKLOAD
   - ☐ WENT ON VACATION
   - ☐ UNANTICIPATED ABSENCE (OR ILLNESS)
   - ☐ GOT TURNED OFF AND GAVE UP
   - ☐ OTHER (please specify) _____

2. WHAT WAS YOUR OVERALL IMPRESSION OF THE COURSE?
   - ☐ EXCELLENT COURSE, ONE OF THE BEST I'VE TAKEN
   - ☐ ADEQUATE, ABOUT AS GOOD AS MOST
   - ☐ TERRIBLE, ONE OF THE WORST I'VE TAKEN

3. WHY DID YOU TAKE THIS COURSE?
   - ☐ NEED IT IN MY WORK
   - ☐ FOR MY OWN INTEREST
   - ☐ OTHER (please specify) _____

4. DID YOU LEARN FROM THE COURSE WHAT YOU NEEDED TO KNOW ABOUT THE SUBJECT MATTER?
   - ☐ YES, I'M QUITE SATISFIED
   - ☐ PARTIALLY, BUT THERE ARE STILL A FEW GAPS
   - ☐ NO, THERE ARE A LOT OF GAPS

5. IN YOUR OPINION, WHAT WAS THE BEST FEATURE OF THIS COURSE?
   _____

   THE WORST FEATURE? _____

6. WHAT ARE YOUR RECOMMENDATIONS FOR IMPROVING THIS COURSE?
   _____
   _____

Figure L-2. The course evaluation form used in the follow-up.

*Note- this form is actually bright yellow in colour, and 8 1/2 x 11 inches large.

APPENDIX M

Tabulation of Follow-up Results, Item by Item

KEY: Group One (reading, old audio tape, quiz) is represented by CC 

Group Two (reading, slide/tape, quiz) is represented by E1 

Group Three (slide/tape, quiz, reading) is represented by E2 

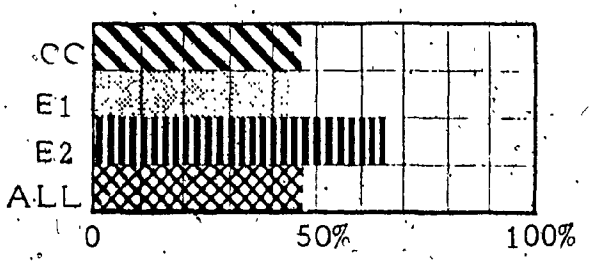
The average of the above three groups is represented by ALL 

The lines represent the percentage of respondents in each group who answered the item as shown in the keys under each question.

Number of respondents to this questionnaire: Group One-13; Group Two-7; Group Three-3; total-23.

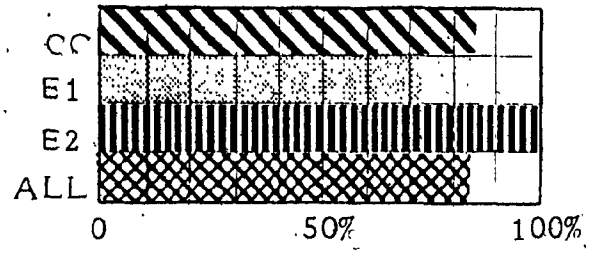
Have you used MARK IV in your job since completing the course?

coloured area=yes
white area=no



Did you complete the course?

coloured area=yes
white area=no

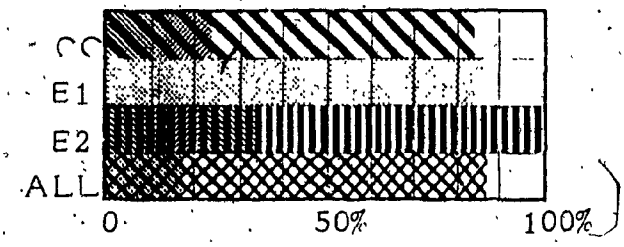


If not, why not?

"sudden change in workload" was the reason given by all respondents who answered this item.

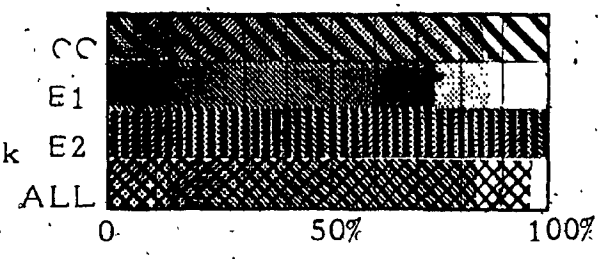
What was your overall impression of the course?

dark area=excellent
medium area=adequate
white area=terrible



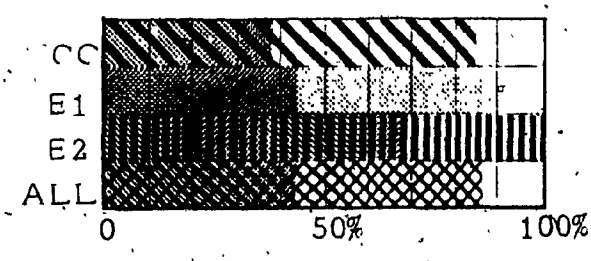
Why did you take this course?

dark area=need it/work
medium area=interest
white area=other



Did you learn from the course what you needed to know about the subject matter?

dark area=yes
medium area=partially
white area=no



IN YOUR OPINION, WHAT WAS THE BEST FEATURE OF THIS COURSE?

Group One:

learner-paced instruction (six respondents)

hands-on problems (five respondents)

Group Two:

hands-on problems (three respondents)

trial and error learning (one respondent)

Group Three:

hands-on problems (two respondents)

slide show (one respondent)

THE WORST FEATURE?

Group One:

poor quality of the tapes (three respondents)

not enough advisor assistance (two respondents)

no logical sequence to the material (two respondents)

lack of overview (one respondent)

slow turn-around at the RJE (one respondent)

Special Features not covered (one respondent)

(Special Features are MARK IV software packages)

Group Two:

poor quality of the tapes (two respondents)

not enough advisor assistance (one respondent)

Special Features not covered (one respondent)

Group Three:

the Fundamentals course (one respondent) (the CSF prerequisite course)

WHAT ARE YOUR RECOMMENDATIONS FOR IMPROVING THIS COURSE?

Group One:

rearrange the material (four respondents)

add more problems (three respondents)

more advisor assistance (three respondents)

clarify the objectives (two respondents)

add an overview (two respondents)

Group Two:

have slide/tape shows for all units (two respondents)

update and simplify the tapes (one respondent)

hold group study sessions (one respondent)

Group Three:

synchronize the tapes and the foils better (two respondents)

have a better prerequisite course (one respondent)

have slide/tape shows for all units (one respondent)

APPENDIX N

Formative Evaluation Results

Did the order of topics make sense?	YES 14 NO 0
What order would have been better?	(no suggestions were ventured)
Would you have understood the material just as well without the slides?	YES 2 NO 12
Would you have understood the material just as well if it had been presented to you as reading material instead?	YES 1 NO 13
How confident are you about your ability to learn MARK IV?	Very confident 11 Doubtful 3 Very unconfident 0

What is your overall impression of MARK IV at this point?

.....

-MARK IV is designed to aid civilians.

-Will prove to be a useful tool in my work.

-Similar to RPG (Report Program Generator-another computer language) but the forms are easier to fill in.

-A very interesting language to learn because of its flexibility and default conditions.

-Relatively simple for Users of the programs.

-I know enough now to use it with the help of the Reference Manual.

-MARK IV seems easy and useful, requires no real programming knowledge.

-Complicated and confusing set of forms to fill out to get data.

APPENDIX O

Description of the MARK IV course at CP

Course Title: MARK IV RETRIEVAL LANGUAGE

Course Length: 7 full days or 12 half days

Media: Audio tape with text

Intended For: Individuals who want to retrieve information from computer files and produce printed reports on terminals connected to the computer.

Overview:

The MARK IV system allows you to write computer programs that access information on computer files and obtain reports in a format you specify.

The student is shown how to describe information files to the MARK IV system and how to have MARK IV select and process information to produce reports according to his requirements.

Hands-on experience is an integral part of the course.

Prerequisite:

"The Colour Computer" or "Computing Systems Fundamentals" or previous programming experience.