I. GENERAL INTRODUCTION

PROJECT CAREER/CAN (Career Analysis Network, OEG-73-3967) was funded for a twelve month period commencing in July, 1973 and terminating June 30, 1974. The goals of the project were focused on the development of information and delivery systems which would cut across grade lines and provide career information to students and teachers in grades K-14[4]. The structure of this Project was intended to enable further development of the behavioral objective product to include four columns of curricular information and to absorb the ongoing pilot activities that had been started under PROJECT CAREER.

PROJECT CAREER (Computer Assisted Research for Educational Relevance) was funded for a three year period commencing July 1, 1971, and terminating June 30, 1974. The primary mission of this project was "to develop, test, and evaluate a process designed to facilitate, at the secondary and post-secondary school levels, the learning of marketable knowledge, skills, and attitudes which are needed to secure employment in selected current and emerging occupations."[2] During the first fiscal year of the Project, two additional grant proposals were written and funded. PROJECT CAREER/GUIDANCE (OEG-0-72-4651) was funded from July 1, 1972 to November 30, 1973, with the termination date for final reporting purposes extended to June 30, 1974. PROJECT CAREER/HANDICAPPED (OEG-0-72-5170) was funded from July 1, 1972, to June 30, 1974, with an extension for some final internal report

writing through September, 1974.

The above-mentioned ongoing pilot activity was to be implemented by PROJECT CAREER/GUIDANCE and PROJECT CAREER/HANDICAPPED. CAREER/GUIDANCE had as its mission to take the knowledge base (a behavioral objective product) and capabilities of the parent project (now identified as PROJECT CAREER/DEVELOPMENT) and "develop, test and evaluate a new approach to providing students from levels K through post-secondary with better knowledge about the spectrum of occupational opportunities that really exist, information about the educational requirements which relate to them, and objective data on their own abilities and limitations in relation to the requirements of occupations of interest."[3]

CAREER/HANDICAPPED also was to draw on the data base developed by PROJECT CAREER/DEVELOPMENT and had as its goal "meeting the individual needs of persons with physical, emotional and other disabilities, so that they can, insofar as they are able, have educational and occupational opportunities equal to those of students who are not handicapped."[4] When the Third Party Evaluator began the evaluation in January 1973, these three components (CAREER/DEVELOPMENT, CAREER/GUIDANCE, CAREER/HANDICAPPED) constituted the totality of PROJECT CAREER and each component was dependent on the product development for the accomplishments of its goals in the testing or piloting phase.

Because each component of PROJECT CAREER as well as PROJECT CAREER/CAN were in some way dependent on the core project, the separately reported projects need to be set in this overall context. Some overlapping in these reports is inevitable, but the evaluators have made an effort to focus the final reports only on those aspects of the component being treated in each report.

This report is a summative evaluation of PROJECT CAREER/CAN, covering its one year funding period. The report will describe and evaluate the development of the four column process which completes the behavioral objective data base. The pilot testing of this data in some high school classrooms will also be evaluated on the following pages.

II. ABSTRACT

PROJECT CAREER/CAN was funded for the period of July 1, 1973 to November, 1974. The major goal of this Project was to complete the development of four column curricular information for each of the PROJECT CAREER behavioral objectives, and to complete the pilot testing of these BO's in secondary classrooms. These objectives were absorbed from another component of PROJECT CAREER and were utilized by this Project after they had already been implemented for at least 12 months.

PERSONNEL

Personnel for implementing this Project were drawn from the central staff of PROJECT CAREER. The key person was the Curriculum Administrator, Mr. Roger Ritch, who was responsible for the four column development work. To assist him in this work, he had two interns and approximately 40 sub-contracted personnel trained and supervised in the writing of the four column material. In connection with the secondary school pilot testing, there were eight classroom teachers involved in two high schools.

PROJECT
IMPLEMENTATION

Four column development was well organized with a recruitment and training system that enabled the writing of the four columns to keep pace with the supply of three part BO's coming from earlier stages of the product development. Several manuals were developed

to aid in the writing of one of the four columns. Other manuals for the other four columns were brought to the draft or planning stage.

The pilot test, although producing some positive response from the teachers involved, was not an adequate test of the final product complete with four columns. Only two occupational groups were tested and most of the BO's used for testing were incomplete or inadequately packaged for use. This Project did not put any additional resources into piloting although piloting was part of the original objectives of the Project.

FINDINGS

1. The additional four columns of information added to the three part Mager objective represents a significant and innovative advance for occupational education. This is a highly transportable product.
2. Full development of the process for producing the four columns is not yet complete. The models for development of additional manuals and standards of quality control are ready and will be developed.
3. A data bank of completed four column objectives for 116 occupations is complete.
4. A sample package of the product indicates that there is still much variability of quality in the four columns. The weakest columns were prerequisite skills and component

tasks. The concepts column was the most fully developed.

5. Computer retrieval capability is now available for several useful configurations of data. Additional column coding is necessary to make the computer capability fully useful.

6. The limited pilot testing established that the data, at this time, has high impact on occupational instructors and moderate impact on academic teachers. The pilot test did not produce measurable impact on students at this time.

RECOMMENDATIONS

In view of the above findings, the Third Party Evaluator recommends the following:

1. That the Project not release any more data for testing until any batch to be released has been subjected to additional editing, and any gaps in information have been filled.

2. That the Project give high priority to completing the final remaining development steps for the four columns, namely the completion of the remaining manuals and coding.

3. That upon the completion of the remaining four column manuals, the completed four column objectives be re-edited and coding added where missing.

4. That additional pilot testing be backed up with careful in-service training for the personnel conducting the test, that regular follow-up contact be maintained to monitor progress, and that adequate support personnel be made available to consult on instructional design development using the Project data.

5. That additional programs and configurations of data retrieval be limited until the initial retrieval programs can be tested for their feasibility and potential user demand.

6. That the Project make a major investment in developing a few alternative ways of sequencing and packaging the data to maximize the value and usefulness to potential users.

CONCLUSION

PROJECT CAREER/CAN was funded July 1, 1973, and in June, 1974, was evaluated on its three major objectives which were to complete the addition of four columns of information to the PROJECT CAREER behavioral objective, to computerize these data for effective user retrieval, and to pilot test the use of the product in the classroom. All of these objectives were inherited from ongoing components of PROJECT CAREER that began twelve to eighteen months before this Project was funded. The funding from this Project was entirely directed toward the first two objectives, with the third objective

allowed to continue on its own from previous funding. The evaluative findings substantiate that the first two objectives were effectively accomplished and the product at this point is about 90% complete. A sufficient data bank has been established to warrant further testing. The pilot test established the feasibility of using this product in the classroom, but was too limited and ineffectively monitored to provide more than rudimentary data for further product development.

III. HISTORICAL HIGHLIGHTS

PROJECT CAREER/CAN (#V361049L, Grant #)EG-72-2967) was originally written in proposal form about January 1973, and was then eventually funded under the aegis of the new PROJECT CAREER Director, Mr. Lamo, to begin July 1, 1973, and to end November 30, 1974. Formal Third Party Evaluation covered a twelve month period through June 30, 1974.

PROJECT CAREER/CAN was designed to allow for an extension of certain aspects of the work already developed under PROJECT CAREER/ DEVELOPMENT and PROJECT CAREER/GUIDANCE. At the outset of this Project in July 1973, each of the CAREER/CAN objectives had already been initiated. The mission of this Project, then, was to carry through with the implementation of objectives that were part of earlier funded proposals.

PROJECT
OBJECTIVES

This Project had three basic objectives:

- To develop the basic three part PROJECT CAREER behavioral objectives, validated for occupations, into an educationally relevant objective with four additional columns of curricular information.
- To expand the computer capabilities for providing user information based on these objectives.
- To pilot test the capabilities of using these objectives in curriculum development, instruction, and guidance.

The baseline for these developments was to be the availability and/or the continuing development of validated three part objectives from PROJECT CAREER/DEVELOPMENT. Pilot testing and computerization of the data had already been implemented by PROJECT CAREER for more than twelve months prior to the funding of this proposal.

During the ensuing twelve months of this Project, significant strides were made in the development of the four columns for the BO's. The pilot activities, however, were not augmented and LEA personnel continued on their own with developments they had worked on during the four week workshop of July, 1973. This workshop was a major event designed to further the piloting objectives of CAREER/CAN.

IV. EVALUATION DESIGN

The evaluation of PROJECT CAREER essentially involved the development of systematic information gathering procedures that would be useful for ongoing formative evaluation of a research and development project. The Project existed to develop a product and to test the feasibility of its use in the school setting. Although there was an early implication in the Project's aims that a final possible outcome could take the form of student learning, in reality, the Project never did come close to attaining this as an ultimate outcome. Thus, the outcome or summative evaluation problem was primarily limited to a study of the final product and the process through which it was developed. Part of the evaluation of that product came from data supplied by potential users of the product as they tested it out in its early form in the classroom.

Since the Project never had a systematic, carefully monitored field testing component with specific targeted outcomes, the most systematic evaluation could come from monitoring the data development process. While this process was itself subject to experimentation and change, there was at least a systematic, flow charted procedure whereby the product was to be developed and produced. Until the final phases of the Project, therefore, evaluation concentrated on process and was formative in nature. The evaluation design was intended to provide the Project with ongoing evaluative feedback

that could be used to improve and enhance the development of the product and its testing.

A comprehensive written evaluation design was developed based largely on process and product output objectives, which provided a very systematic basis for information gathering. The nature of these objectives and the Project itself lent itself toward much qualitative evaluation. Quantitative outputs were in the form of cumulative counts. In their design, the evaluators strove for the most systematic collection of information possible in a form that would be most useful for ongoing decision making regarding the Project's aims. Some of this information gathering took the form of ongoing consultation with members of the Project Staff. Eventually, the Evaluators developed a form of interim reporting in which full reports and shorter memos were prepared on specific aspects of the Project in order that this information would reach the Project soon enough to be of value.

In response to the formative recommendations that were made in NEESI's quarterly and interim reports, the opportunity for a great deal of dialogue developed between the Project Staff and NEESI Consultants. This process, in turn, provided the source of follow up activities on the part of the evaluators as needed changes and modifications were identified. Information was continually sought from the Project as to whether or not changes had been made as well as for documentary evidence that changes had taken place.

INFORMATION GATHERING TECHNIQUES

The following is a listing of various information gathering techniques employed by the evaluators in implementing the general evaluation plan described above.

- Interviews with key Project personnel.
- Interviews with LEA personnel.
- Interviews with sub-contracted personnel (e.g. converters, validators, coders, etc.)
- Structured surveys or questionnaires of certain Project personnel.
- Inspection of documents, both internal, management documents and products and activities produced by the field testing.
- Consultation with outside experts.
- Product evaluation following standards established by instructional product design experts.
- On-site observation of field testing activities, workshops, conferences, and personnel training sessions.

WRITTEN DOCUMENTATION

To provide for consistent and systematic feedback of this information to the Project, the Evaluators submitted the following written documents:

- Five written evaluation design proposals.
- Seven quarterly reports.
- Interim formative evaluation reports on the following aspects of PROJECT CAREER: a) two reports on validation;

b) two reports on four column development; c) one report on general product development and packaging; d) one report on pilot activities; e) one product evaluation report.

- Whenever key Project central staff were interviewed, memos summarizing the interviews and the understandings reached were sent to PROJECT CAREER within one week.

Some of the complexity of monitoring all the Project's available sources of information can be appreciated by the fact that over the life of the Project, there were nearly 400 different persons involved in some aspect of the Project. Besides the basic full time Project staff based in the Randolph, MA. headquarters, there was a large group of affiliated LEA personnel in over ten different schools, as well as hundreds of sub-contracted personnel that performed the tasks of writing objectives, validating objectives, coding objectives, and writing four columns for the objectives. The evaluation team made an effort to have some contact, if only through a survey form, with all of these persons.

V. PROGRAM OBJECTIVES

As was pointed out in the introduction to this report, PROJECT CAREER/CAN was funded for the purpose of augmenting, in three main areas, the work of PROJECT CAREER:

- Four column development of BO's.
- Expansion of computer capabilities for information retrieval
- A feasibility test of the four column data for use in K-12 classroom and career guidance programs.

In the following section of this report, we shall specify each of the three Project objectives and give summative comments on the status of those objectives after twelve months of Project activity. More detailed data will be provided in subsequent sections of this report.

STATUS OF
OBJECTIVES

1. GIVEN 50,000 VALIDATED BEHAVIORAL OBJECTIVES, DEVELOP IN RELATION TO EACH, THE BASE DATA FOR INCLUSION UNDER THE CATEGORIES OF (A) PRE-REQUISITE LEARNINGS, (B) COMPONENT TASK, (C) ENVIRONMENT AND (D) CONCEPTS.

The figure of 50,000 behavioral objectives was a targeted figure established early in the life of PROJECT CAREER. This figure, however, was never more than an estimate of what the Project might be able to develop. By the time PROJECT CAREER/CAN was actually funded, the parent project had produced about 550 completed four column objectives.

By June 30, 1974, the total number of four column objectives completed was about 9500, covering all but a few of the 116 occupations on the PROJECT CAREER list. Other significant developments were the completion of coded manuals for related concepts from the fields of mathematics, science, and business; the completion of a coded manual for prerequisite skills in mathematics; the initial draft of a manual for coding alternative environments; and the development of a model for completing additional coded manuals to include the component tasks column.

The recruitment of four column writers as well as their training of the writers was developed to the point where production could be kept up to the availability of validated three part objectives in any of the PROJECT CAREER occupations.

2. GIVEN 50,000 VALIDATED BEHAVIORAL OBJECTIVES WITH RELATED INFORMATION (A,B,C,D, IN #1), DEVELOP AN AUGMENTED COMPUTER CAPABILITY FOR STORAGE AND RETRIEVAL OF INFORMATION BY ELEMENTARY, JUNIOR HIGH, SECONDARY AND POST SECONDARY COUNSELORS AND TEACHERS.

Computerizing the data as it was developed had already been build into the PROJECT CAREER system. The computer hardware was augmented before this present Project was funded to allow for a disc system with added storage capacity. Nearly 100% of the computer needs of the Project during the twelve months of this funding period were taken up with data development. Except for one or two isolated instances, no actual data retrieval for classroom

or guidance use was undertaken during the life of the Project.

However, as we shall document in a separate section, the needs of users for certain combinations of data were programmed and the planning of computer time and capacity for meeting user needs in further testing of the product was accomplished.

3. PROVIDE IN-SERVICE TRAINING TO ELEMENTARY, JUNIOR HIGH, SECONDARY AND POST SECONDARY COUNSELORS AND TEACHERS IN THE PILOT DISTRICTS IN THE UTILIZATION OF THE COMPUTERIZED RELATED INFORMATION DATA DEVELOPED IN OBJECTIVE #1.

By mid-way through the Project year, it was evident to both the evaluators and the Project Staff that no further work after the Summer Workshop had actually been carried out with the pilot LEA's. At the urging of the evaluators, the Project Directors revised the objectives for the pilot testing to focus on the role of the pilot testing as it impacted on data development. Final summative evaluation of pilot activities was therefore based on the revised objective, and the details of this evaluation will be provided in a subsequent section of the report.

The objective as it was written above, however, was never implemented. No completed four column objectives with complete computer retrieval capabilities were ever developed early enough to provide an adequate test of the product as its potential use. Thus, all piloting was extremely limited in the extent to which it could serve as a test for the fully developed model originally

envisaged in the language of the proposal.

Another factor that accounts for the limited attainment of this objective, was the fact that the final budget for this Project did not actually fund this objective. The only budgeted costs associated with this objective were a portion of administrative costs that went into limited planning and supervision of the LEA effort.

If we were to limit our evaluative considerations to the actual relationship between the stated objectives, the budgeting and disbursement of funds assigned to this Project, and the actual observed level of Project staff involvement in the pilot LEA's, then we would conclude that this objective of CAREER/CAN was actually never implemented. In point of fact, however, there was pilot activity going on sustained by funds from other components of PROJECT CAREER, and on which we shall report in subsequent sections.

VI. ADMINISTRATION AND PERSONNEL

There were two categories of personnel involved with PROJECT CAREER/CAN (excluding LEA personnel). One was the full time staff at Project headquarters in Randolph. The other category were comprised of part time sub-contracted personnel that wrote the four columns. This section will discuss these categories separately, as well as the general administration of the Project. Because the same central staff performed functions associated with all components of PROJECT CAREER, the description and evaluation of administration and central staff will be similar for each component of the Project.

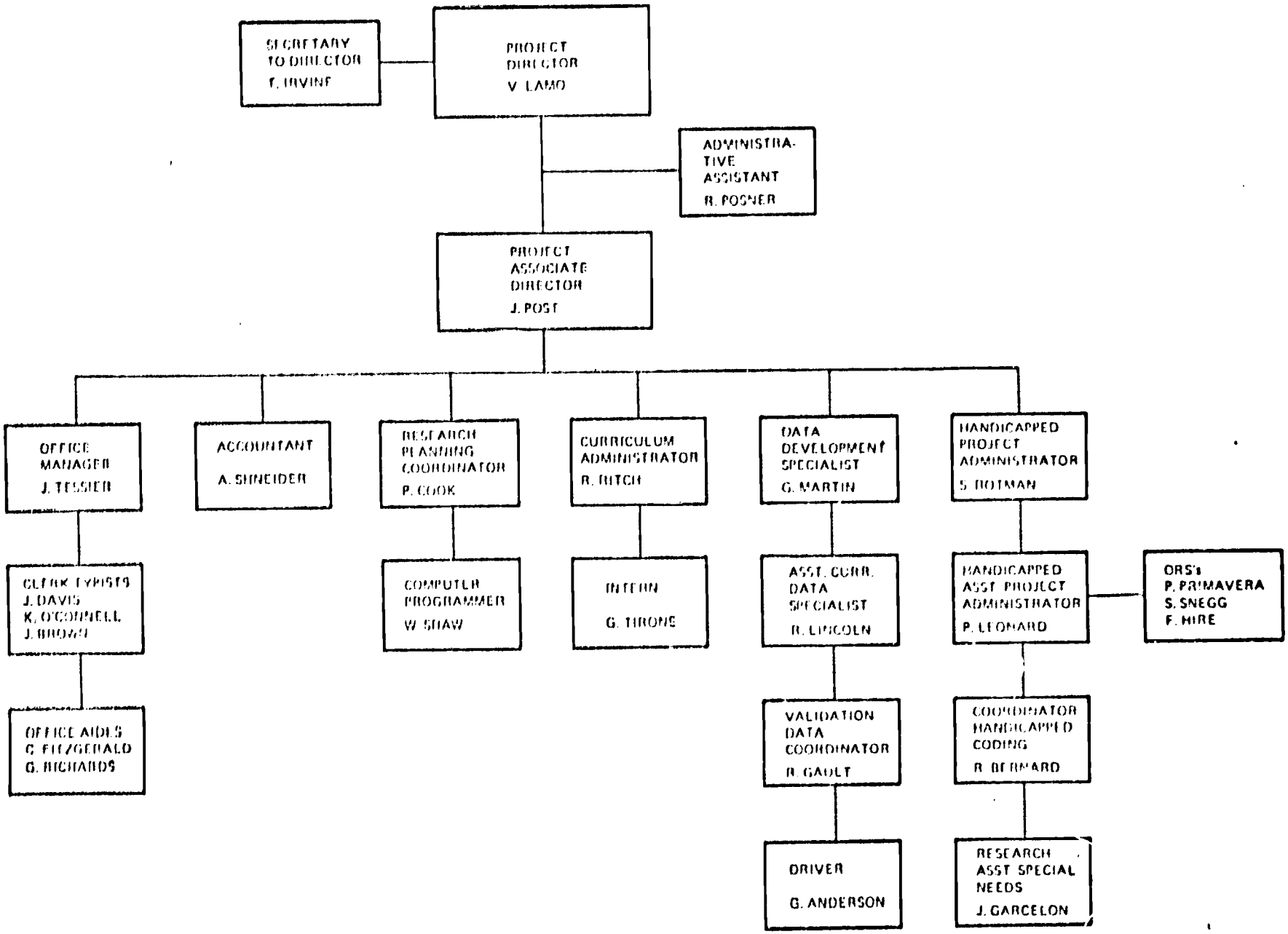
OVERALL ADMINISTRATION

The administrative structure of PROJECT CAREER is represented in part by the organizational chart on the following page (Figure 1). This chart indicates job titles that are associated with various functions required to carry out the overall operations of the Project. Nearly all of the full time professional staff were assigned to duties represented by at least two job titles. Written job descriptions were developed for each of these positions.

The job titles and the written specifications adequately represent the range of functions needed by the Project to accomplish most of its objectives. NCESI's Third Party Evaluators have some question as to whether the Project was staffed with sufficient

PROJECT CAREER ORGANIZATION CHART Figure 1

JUNE 30, 1974



expertise in sophisticated research functions, and in curriculum and instructional design technology. But these are matters of judgment and hindsight based on the performance of the already hired staff.

In the same vein, there was not always a close match between the training and experience specified for the job title and the training and experience of the person hired for, or appointed to the job task. Again, we must allow for some flexibility to account for the market in available personnel, and the fact that many of the capabilities needed for success in any of the Project tasks had to be developed through experience. In the opinion of the Third Party Evaluators, the Project staff were generally competent, enthusiastic, and dedicated. They were able to implement most of the Project objectives to a successful conclusion. But the Project staff did not, in the final analysis, possess all of the capabilities which could have been used. The two major weaknesses were noted above.

FISCAL
MANAGEMENT

A part time accountant was hired who installed a fiscal management system that enabled the careful control and accounting of the funds allocated to the Project. The final decision to hire the accountant was due to the Project Administrator's realization that this was a most important step to take as soon as he became the overall administrator in November, 1973. This system included a

bi-weekly report that provided the director with the following information:

1. Budgeted dollars for the total funding period by line item andpercentage of the total.
2. Dollars spent by line item during the two week report period.
3. Percent of the total line item budget for that period.
4. Percent of the total spent during that period by line item.
5. Cumulated dollars spent to date.
6. Percentage of total line item budget spent to date.
7. The balance remaining of the budgeted dollars for each line item.

The system provided for the use of a triplicate voucher that enabled the careful tracking of all money disbursed by the coded budget numbers. These vouchers were the basis for the fiscal records. The vouchers were the basis for the fiscal records. The vouchers could be compared with actual amounts paid out by the checks drawn against the Project's account. The Third Party Evaluators have received all of these bi-weekly reports.

STRONG POSITIVE
ADMINISTRATION

Effective project management includes a well developed structure for allocating personnel to tasks, including recruiting and training, and a sound fiscal management system. In addition to these tangible structures, there are the intangible aspects of

establishing a good working environment, providing for effective interpersonal communications, establishing decision making procedures that are geared to the nature of the Project and the professional staff, supervising staff and functions so that quality is maintained and projects are completed, and in general, providing the Project with sound leadership and good public relations.

The information summarized above indicates that the Project did develop reasonable, successful administrative and fiscal structures. In general, competent personnel were hired and assigned to tasks that they were capable of performing. Quality control was maintained to some degree at least as evidenced by the departure from the Project, by agreement, of any staff person who was not performing adequately in an important task.

REPORTING AND RECORDS

With the exception of fiscal reporting and personnel records, which were described under Administration, the major reports and records maintained by the Project were the following:

1. Quarterly and Annual reports.
2. Data production reports, periodically prepared for internal circulation.
3. Logs of data development processes such as validation, coding, four column writing.
4. News and Views, a newsletter circulated to all LEA personnel and others affiliated with and interested in PROJECT CAREER.

The major record keeping problems were discussed under ADMINISTRATION AND PERSONNEL. With regard to the above list, the judgment of the Third Party Evaluators is that these reports were relevant to and adequate for the needs of the Project in these areas.

VII. GENERAL FINDINGS

The summative details of our evaluative findings will be provided in this section and will be keyed to each of the three major Project objectives - four column development, computer capability, and pilot testing.

FOUR COLUMN DEVELOPMENT

The complete PROJECT CAREER behavioral objective, as it was eventually defined after several developmental stages, consists of a task outline listing the major responsibilities and duties of the occupation; three part Mager objectives based on the duties or duty examples; codes indicating the attainability of the objective by different handicapped populations; and four columns of additional information that enable the objective to be related to curriculum and instruction. The handicapped coding was in independent operation that did not alter the objective in any way. But, the addition of the four columns was a significant advance enabling the teaching of occupational skill objectives or job task statements directly in the classroom.

The Third Party Evaluators made two extensive analyses of the basic four column model for the purpose of formative evaluation. These were submitted as separate reports on December 27, 1973, and March 15, 1974. The model was examined, along with a sample of completed data, by a leading expert in instructional design, Dr.

Leslie Briggs of Florida State University. In considering this model, its potential value for curriculum development and instructional design, and other possible alternatives for designing such objectives, THE EVALUATORS, WITH THE SUPPORT OF DR. BRIGGS, CONCLUDED THAT THIS BEHAVIORAL OBJECTIVE PRODUCT WITH THE FOUR COLUMNS OF INFORMATION IS AN OUTSTANDING INNOVATION.

The four columns are defined as follows, taken from the four column writers training manual (see Appendix, page A-23):

- Pre-Requisite Learnings - Those skills, knowledges, understandings and attitudes, which will not be taught during the treatment, but which are necessary for a student to possess in order to facilitate the acquisition of the new behavior.

- Component Tasks - The individual activities which are necessary for the completion of the listed behavior when that behavior must have component tasks performed in sequence.

- Environment - The alternative environments which may be utilized for acquisition of the listed behavior, i.e. - media, mode of instruction.

- Concepts - The abstract rules, principles, laws, and/or generalizations which are related to the performance of the listed behavior. These are listed for purposes of providing for the transfer of learning as well as for interdisciplinary approach to instruction.

- Production Strategy - The detailed objectives from the original proposal called for the four columns to be written by teams of writers combining occupational expertise and educational expertise. As the writing was fully implemented, however, these teams, with a few exceptions, were never formed and all four columns were written by the same person. The writers were recruited from occupational educators or persons with both job and teaching experience in a given instructional area represented by the BO's assigned to the writer.

Ultimately, there will be manuals developed for each column with coded entries so that a writer can generally select the necessary information from the manual, and enter it along with the code on the grid sheets. These manuals are not intended to be limiting, however, and when a manual does not contain information that a writer believes should appear in a given column, that information is to be included.

For the current production year, the only fully developed manuals available were those for the concepts column. Here the writers had access to lengthy lists of coded concepts for mathematics, science, and business. An inspection of these manuals revealed them to be well organized and extensive. The concepts were alphabetically by categories.

The first of several planned manuals for the pre-requisite skills column was completed for math skills. Additional manuals are planned for science skills, communication skills, and occupational skills.

An alternative environments manual has been completed in draft form, but will not be coded or published until the information can be organized by USOE Occupational Clusters. This organization will enhance the value of the manual, since potential users can consider a number of alternative learning environments (which includes tools and equipment) for the different occupational clusters. No work has been done, as yet, on a manual for the

component tasks column. Such a manual requires a simple to complex sequencing operation of the available data before component tasks can be placed in a manual. This eventual sequencing will be a major step forward for the product, for it will enable the relating of data to learning hierarchies.

Four Column Writers

Written job specifications for four column writers include the following:

1. Current industrial-occupational experience in the area assigned for curriculum development.
2. Instructional or job training experience.
3. The ability to work as part of an interdisciplinary team charged with making joint decisions.
4. A knowledge of minimal related area requirements for successfully performing job skills.
5. A knowledge of developing curriculum materials for instructional use.
6. A willingness to expend a "reasonable" amount of time in the development of four column data.
7. A willingness to base a working relationship with PROJECT CAREER on a successful performance level.

Mr. Roger Ritch, the Project's Curriculum Administrator, developed a detailed recruiting and training plan. Writers were successfully recruited from newspaper advertisements and through extensive contacts with the regional vocational-technical schools. A one page personal data sheet was collected for each person.

Applicants were interviewed and, simultaneously given individual training. Quality control, and retention as a writer was based on successful continuing performance based on a 100% edit of the returned material.

Since the writing was never implemented on a team basis, qualification #3 was never required. The evaluators inspected the complete records of all active and inactive four column writers, and found that there were no exceptions to the qualifications required for items #1 and #2. For example, a writer for the instructional area of inhalation therapist was listed as a respiratory therapist with 7 years experience; a writer for auto and diesel mechanics was an automotive teacher with 15 years experience; a writer for nursing, nursing assistant, and medical laboratory technician was a registered nurse with 14 years experience, including the teaching of licensed practical nurses.

As of June 1974, there were 31 active four column writers and 13 who had written but were currently inactive. Their years of experience ranged from two to more than twenty years with a median of about seven years. As of the end of June 1974, the instructional areas covered by these writers included about 80 of the 116 occupations.

Productivity

Productivity over the first six months of the Project averaged about 300 BC's per week when there were sufficient validated three

part BO's available. During one high production period, as many as 500 a week were completed. By the end of the Project, the system was capable of recruiting and training a sufficient range of manpower to keep up with the production pace of validated three part objectives. Total production of completed four column BO's by June 30, 1974, was approximately 9500. Mr. Roger Ritch estimated that, by September, BO's for all 116 occupations would be complete with four columns. Estimates of that final figure ranged from 12,000 to 16,000.

The Product

No careful, objective evaluation of the quality and utility of this product is possible at this point. Some information on utility will be discussed under findings from the pilot testing. This testing was limited to just two occupational groups, electronics and business.

There are a few comments that can be made about the quality issue. First, the quality of the final product depends, to some extent, perhaps a large extent, on the quality of the three part BO. A check of a final batch of completed BO's for automobile mechanics, supplied by the Project for purposes of evaluating a sample of the final product, indicated that there is still wide variation in the quality of the three part BO.

Feedback from the four column editors, based on their editing of the columns and their training and follow-up contacts with the

four column writers, indicated that the order of difficulty in writing the columns follows the order of the columns: pre-requisite skills is most difficult to write, component tasks next, then environment, and concepts is the easiest. The latter is also the only column with completed manuals for the writer.

Our scanning of the sample of auto mechanics BO's would tend to confirm this order of difficulty. Pre-requisite skill columns were highly variable, many containing items lacking the stems "use of," "knowledge of," or "ability to," as prescribed in the editor's manual. A typical item found in many of the auto mechanic pre-requisite skills columns was "8th grade reading." Presumably this relates to the reading level of the instructional manual for car repair. However, at least one user of these BO's with the educable mentally retarded, suggested that this was a meaningless pre-requisite since many of the skills could still be learned without this reading ability. Sometimes a concept would appear by itself in the pre-requisite skill column and again in the concept column.

Component task columns covered a wide range of detail. Some simply repeated the task statement. Some specified that the automobile instruction manual be followed. And some were detailed task breakdowns of the more complex task statement in the three part BO.

Obviously, the only effective evaluation of the quality of this four column information can come from the occupational educator who will use the data for instructional purposes. As we shall detail below, testing of this data has been extremely limited to date. The evaluators have reason to believe that the sample package of data we were shown does not represent the best that is available from the Project at this time.

Finally, we note again that the process is still not yet fully developed. In the absence of the remaining manuals for use by writers, the information produced will not be as systematic as it needs to be, nor will variability in quality be reduced to a more tolerable level. However, it is clear from an inspection of the final product that the amount, extent, and general quality of information now available for teaching these skills is far in excess of what most teachers presently have available, and would undoubtedly be welcome support in any occupational teacher's instructional planning.

COMPUTER
RETRIEVAL

The second of the three major objectives of CAREER/CAN carries the following specifications from the original proposal:

1. Retrieval of pre-requisite learnings for a single behavior or clusters of behaviors.

2. Retrieval of concepts for a single behavior or a cluster of behaviors.

3. Search across behavioral objectives and/or occupations common to any single or group of pre-requisite learnings or concepts.

4. A commonalities retrieval which will search out behaviors common to a wide range of occupations.

These specific objectives actually cover only a small number of the many useful and important ways in which information, based on these data, could be retrieved from the computer. As the Project stands at the conclusion of twelve months, the lack of coded pre-requisite column material (with the exception of math skills) makes it impossible to implement the above objectives which pre-suppose such coding. Such coded information is available for the concepts column only. One pilot retrieval effort has already been implemented for a user in a pilot school. As the other two columns are coded, this will expand the possibilities even more.

The commonalities retrieval is fully operational at this time, although no commonality searches have been made to determine what the data might look like. From our study of the process and the product as it has been developed, the evaluators believe that the most significant commonality information for instructional purposes will eventually come from the data in the four columns and not from the occupational (job task) skills contained in the three part objectives. But such commonality searches must await the full development of coded information for each of the four columns. Except for the concepts column, this represents several more months of development.

four column writers, indicated that the order of difficulty in writing the columns follows the order of the columns: pre-requisite skills is most difficult to write, component tasks next, then environment, and concepts is the easiest. The latter is also the only column with completed manuals for the writer.

Our scanning of the sample of auto mechanics BO's would tend to confirm this order of difficulty. Pre-requisite skill columns were highly variable, many containing items lacking the stems "use of," "knowledge of," or "ability to," as prescribed in the editor's manual. A typical item found in many of the auto mechanic pre-requisite skills columns was "8th grade reading." Presumably this relates to the reading level of the instructional manual for car repair. However, at least one user of these BO's with the educable mentally retarded, suggested that this was a meaningless pre-requisite since many of the skills could still be learned without this reading ability. Sometimes a concept would appear by itself in the pre-requisite skill column and again in the concept column.

Component task columns covered a wide range of detail. Some simply repeated the task statement. Some specified that the automobile instruction manual be followed. And some were detailed task breakdowns of the more complex task statement in the three part BO.

Obviously, the only effective evaluation of the quality of this four column information can come from the occupational educator who will use the data for instructional purposes. As we shall detail below, testing of this data has been extremely limited to date. The evaluators have reason to believe that the sample package of data we were shown does not represent the best that is available from the Project at this time.

Finally, we note again that the process is still not yet fully developed. In the absence of the remaining manuals for use by writers, the information produced will not be as systematic as it needs to be, nor will variability in quality be reduced to a more tolerable level. However, it is clear from an inspection of the final product that the amount, extent, and general quality of information now available for teaching these skills is far in excess of what most teachers presently have available, and would undoubtedly be welcome support in any occupational teacher's instructional planning.

COMPUTER
RETRIEVAL

The second of the three major objectives of CAREER/CAN carries the following specifications from the original proposal:

1. Retrieval of pre-requisite learnings for a single behavior or clusters of behaviors.

2. Retrieval of concepts for a single behavior or a cluster of behaviors.

3. Search across behavioral objectives and/or occupations common to any single or group of pre-requisite learnings or concepts.

4. A commonalities retrieval which will search out behaviors common to a wide range of occupations.

These specific objectives actually cover only a small number of the many useful and important ways in which information, based on these data, could be retrieved from the computer. As the Project stands at the conclusion of twelve months, the lack of coded pre-requisite column material (with the exception of math skills) makes it impossible to implement the above objectives which pre-suppose such coding. Such coded information is available for the concepts column only. One pilot retrieval effort has already been implemented for a user in a pilot school. As the other two columns are coded, this will expand the possibilities even more.

The commonalities retrieval is fully operational at this time, although no commonality searches have been made to determine what the data might look like. From our study of the process and the product as it has been developed, the evaluators believe that the most significant commonality information for instructional purposes will eventually come from the data in the four columns and not from the occupational (job task) skills contained in the three part objectives. But such commonality searches must await the full development of coded information for each of the four columns. Except for the concepts column, this represents several more months of development.

COMPUTER
FACILITIES

This section of the report, from page 34 to 44, reviews the present status of PROJECT CAREER and PROJECT CAREER/CAN data processing activities together with planned future activities. The report was written by Mr. Larry English, the computer specialist hired by NEESI. Comments are provided on the feasibility of proposed activities as well as the progress made to date in the data processing area. The report provides a brief summary of information presented in previous reports on this subject, dated June 14, 1973 and December 28, 1973, as a context for evaluating the present status of work.

The report is based on information provided in interviews with Mr. John Post, Peter Cook and William Shaw, conducted during July, 1974 and on documents provided by Peter Cook.

The observations and recommendations contained in this section are listed in full on pages 42-44 and the text provides background information relative to the observations and recommendations. These observations and recommendations can be summarized as follows:

- Productivity from the computer operation has greatly increased, and the data processing operation now supports project requirements fully.
- Some projected future project activities require, however, development of some related data processing facilities which do not now exist.

- Although there are minor gaps as noted above, future plans for data dissemination and testing are generally soundly based on the presently available computer hardware and software.

PRESENT STATUS OF CAREER/CAN DATA PROCESSING

In this section, we will review the present status of computer operations for PROJECT CAREER and PROJECT CAREER/CAN and present some comments about the evolution of the computer operation.

Present Activity

PROJECT CAREER and PROJECT CAREER/CAN are concerned with establishing a data base of approximately 20,000 behavioral objectives which have been "validated" in the sense that their relevance to one or more of a group of occupations has been established. Validation of objectives originally involved a several tier screening process. The validation process was an extensive and cumbersome one that required computer support to make it even partially manageable.

Initially, behavioral objectives were first written by persons in various educational areas. The original "yield" in terms of validated objectives from the raw data was relatively low. In addition, the project, in its initial stage, was plagued by large backlogs in the data processing activity and seeming communication difficulties between data processing personnel and other project staff members.

In the initial data generation system, an objective was first keypunched, and a computer file of such objectives was prepared. Objectives were processed in approximately 2000 objective "batches." The objectives in these files were sorted by instructional area subgroups according to the U.S. Office of Education instructional coding system. "ID" numbers were also assigned to the objectives.

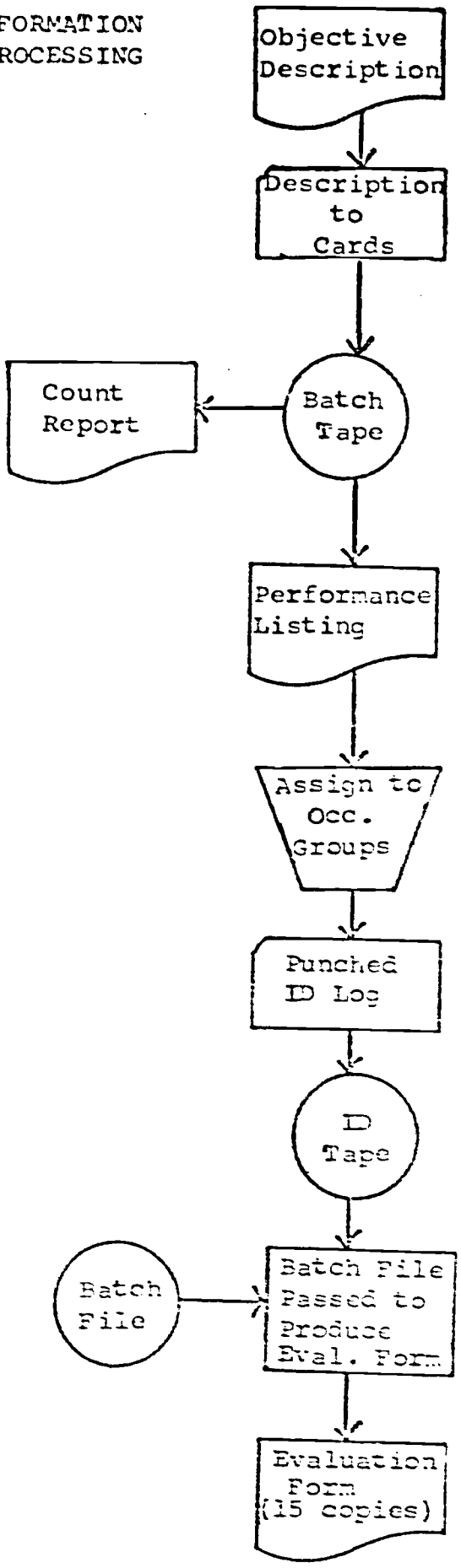
After this initial computer processing, reviewers for each of fifteen occupational clusters determined whether the objectives were relevant to their clusters. A computer file of the ID numbers of objectives assigned to each cluster was then produced. This file was then passed against the initial "batch" of objectives, and questionnaires were produced for a second level of screening. Objectives which passed through both levels of screening were considered validated.

Once objectives were validated, they were annotated and also classified according to the ability of handicapped persons to perform them. Figure 3 illustrates the initial data generation procedure.

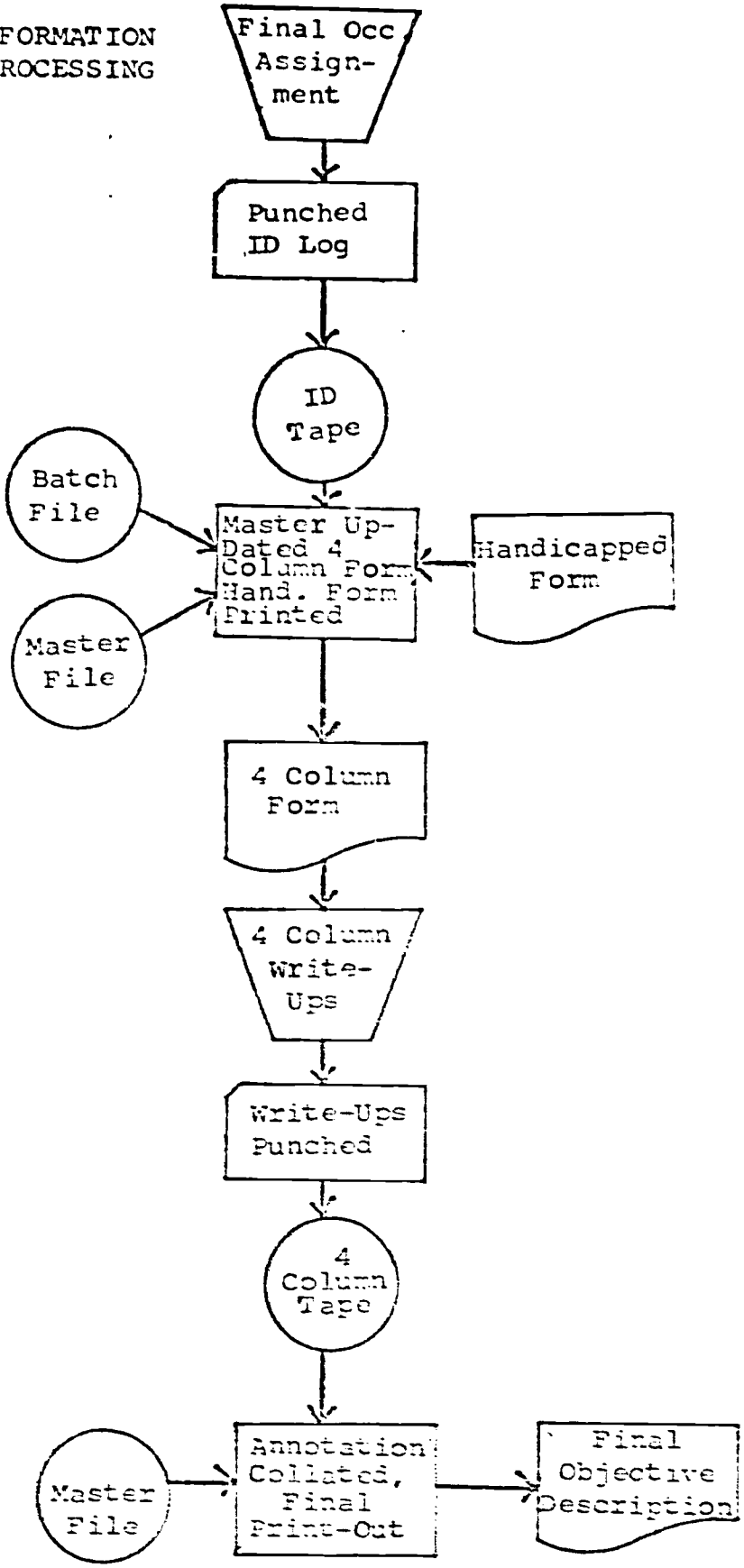
At present, objectives are initially described by persons working in the various occupations of interest to the Project. This has greatly improved data quality, at least in terms of the "yield" in validated objectives. Last year, after two years of work, the Project had only 500 validated objectives. Now, after three years of effort, there are 10,000 validated objectives.

Figure 2

PROJECT CAREER - INFORMATION
OW FOR COMPUTER PROCESSING



PROJECT CAREER - INFORMATION FLOW FOR COMPUTER PROCESSING (cont.)



The improvement in data quality has made parallel efforts possible in data generation. Now the basic validation process, the annotation (four column) process, and the classification for handicapped persons can all be done at essentially the same time without first waiting for completion of the validation process.

HARDWARE FACILITIES AND PROGRAMS

The data generation system presently runs on a Honeywell 240-A computer with a 98,000 character memory, four tape drives operating at 66,000 character per second transfer rates and a density of 800 bits per inch, and 55.2 million characters of on-line disk storage on three removable pack drives.

The data generation system involves approximately fifteen frequently used programs out of a library of approximately 40 programs which are used from time to time and approximately nine additional programs which were written for special purposes and are rarely used or have been used only once.

These programs are written in ANSI standard Cobol and thus can be transferred from one computer to another. Some reprogramming would, of course, be involved in such transfers.

Program documentation is essentially in good form at the present time. Some program documentation problems had existed earlier in the initial stage of the Project, but documentation is now

up to a standard that would support operation of the data generation programs by programmers and computer operators with no previous knowledge of the development of the programs.

GENERAL OBSERVATION

The software used for creating the file of validated objectives has stabilized and reached a level of quality such that it adequately supports project objectives with respect to data processing for data generation purposes. File structures and objective coding schemes have been simplified and improved as the project has progressed. The administration of the computer activity has also improved greatly so that goals and priorities for the computer personnel are now clearly established.

A previous tendency to over use the computer for work best performed by non-computerized printing and reproduction devices has also been eliminated with resulting improvements in data processing efficiency.

PROJECTED FUTURE ACTIVITY

In this section we will describe CAREER and CAREER/CAN data processing plans as they relate to data dissemination, evaluation of data effectiveness, and maintenance of the master data file.

Data Dissemination

During the current fiscal year, the project plans to distribute data to the approximately 350 school districts in the state. Twenty-four of these districts will be selected for special pilot evaluation of data effectiveness.

To do this, the project's data processing group will carry out two kinds of activities:

- Data will be compiled in "off the shelf" catalogs in multiple formats as by job title, by instructional program, by common skill element, or by handicapped grouping.
- Data will also be compiled in special catalogs so long as the requests for compilations of this sort can be supported by existing programs or easily developed new programs.

So far there has been only limited user experience with project data so that the formats and content for the "off the shelf" catalogs have been largely determined by the project staff.

It is contemplated that pre-printed data catalogs could be shipped to requesting users within one day. Requests for special compilations will be honored in roughly one month if programming to support the compilation exists and in a longer period of time if such programming does not exist.

Evaluation

Plans for evaluation are incomplete, but assume assimilation of user reaction in both subjective and quantified forms. One half of the evaluation districts will have special needs populations and

one half will be drawn from populations with normal needs.

The primary intention of the evaluation process is to determine whether or not access to PROJECT CAREER data results in curriculum improvement. A secondary intention in evaluation will be the beginnings of a process to refine and improve the master data file.

Project personnel contemplate some use of data processing techniques in the evaluation process, but no specific plans have been made. Such planning will be undertaken after some initial user responses have been obtained.

Maintenance

Plans for maintaining the project data base are presently incomplete. It is assumed that data development will continue, and that user reaction will also permit constant improvement of the data.

At the moment software for data editing is quite limited. The master data file can be updated by deleting and reinserting a record, but no other procedure exists for correcting records.

OBSERVATIONS AND RECOMMENDATIONS

In this section we will present some comments and suggestions arising from this most recent review of PROJECT CAREER data processing.

1. PRODUCTIVITY FROM THE COMPUTER OPERATION HAS GREATLY INCREASED.

This improvement is partly the result of improved data quality and partly the natural evolution toward a stable and well administered processing facility noted on page . Previously, as

few as ten percent of the objectives initially defined were actually validated, yields of approximately ninety-eight percent are now being experienced. Processing backlogs are largely eliminated, with keypunching being, possibly, the only remaining bottleneck in data flow.

2. HARDWARE AND SOFTWARE FACILITIES ARE ENTIRELY ADEQUATE FOR PRESENT AND PROJECTED DATA PROCESSING OPERATIONS.

The present work load and the work projected for the next fiscal year are easily supported by the present Honeywell configuration. Existing programs and program documentation are also adequate for these operations.

3. ALTHOUGH PLANNING FOR DATA DISSEMINATION IS RELATIVELY COMPLETE, DATA PROCESSING RELATED PLANNING FOR MAINTENANCE OF THE DATA AND EVALUATION OF USER EXPERIENCE REQUIRES ATTENTION.

As noted on page , data processing support is assumed to be required for evaluation and is known to be needed for data maintenance. Both of these activities are projected as occurring during the coming fiscal year, but planning, even to the level of functional descriptions or definitions of required computer support, has been done with respect to data processing.

4. THE DATA DISSEMINATION APPROACH IS SOUND AND AVOIDS SEVERAL COMMON PITFALLS.

The pre-printed catalog concept is one that can be easily supported by the present computer facility and is one that will not require large amounts of new programming. Inherent in plans for handling special compilations of data are procedures for evaluating

such requests for both technical (programming) feasibility and intrinsic worth. This approach will limit the workload for special compilations to a manageable level while still insuring that realizable and worthwhile requests for such compilations are honored. The concentration of data distribution in a single center is also wise, since it permits, in this initial pilot phase of usage, proper control over the quality of the data base and prevents any possible "drifting apart" of the content of multiple copies of the data base. This later problem would be a serious one if the project master file were to be maintained simultaneously at several computer facilities.

5. BETTER COMPUTER PROGRAM FACILITIES FOR DATA EDITING SHOULD EVENTUALLY BE DEVELOPED.

The task of maintaining project data can be met for the time being with the existing limited facilities for record deletion and insertion described in Section IV. Eventually, however, data improvement facilities must be developed so that records can be individually corrected in a single program run and so that common corrections or additions can be made to groups of records in a single run.

PILOT
TESTING

The original objectives of the pilot test, as written in the PROJECT CAREER/CAN proposal, emphasized activities that were guidance oriented and directly related to those objectives already implemented and funded by the CAREER/GUIDANCE component of PROJECT CAREER. Because the CAREER/CAN budget never funded these objectives, and because they were fully evaluated in the report on the project which did fund them, there will be no reference in this report to those pilot activities.

However, the pilot use of the four column BO's in secondary school classrooms is directly relevant to the major thrust of CAREER/CAN, the full four column development of the BO's for instructional use. This pilot test was "inherited" from PROJECT CAREER/DEVELOPMENT, but is best evaluated and reported on in the context of CAREER/CAN, despite the lack of direct funding support from this Project.

The pilot test relevance to the mission of CAREER/CAN was made explicit in December 1973, in a revised set of objectives prepared for the secondary school component. These new objectives identified the major purpose of the pilot test as a means "to determine whether PROJECT CAREER data is appropriate for the implementation in the classroom."

The specific objectives drawn up for this pilot test, which were then communicated to the LEA personnel involved, were the following:

1. Determine if the overall format of PROJECT CAREER data is useful as a basis for curriculum development.

2. Analyze ways in which occupational teachers use each of the parts of the PROJECT CAREER behavioral objective format, i.e. Condition, Performance, Extent, Pre-requisite Learning, Component Tasks, Alternative Environments, and Related Concepts.

3. Analyze ways in which interdisciplinary team members use Condition, Performance, Extent, Pre-requisite Learning, Component Tasks, Alternative Environments, Related Concepts.

4. Identify potential problems in converting raw data into learning packages.

5. Develop processes to convert raw data (PROJECT CAREER format) into individualized learning packages.

6. Test the use of PROJECT CAREER data based lesson plans in different kinds of classroom modes, i.e. small group, large group, individual instruction, etc.

7. Identify problems with implementing PROJECT CAREER data based lessons in the classroom.

8. Determine teacher reaction to using lessons developed from PROJECT CAREER data.

9. Determine student reaction to working with instructional materials based on PROJECT CAREER data.

The basis for testing the above set of objectives was extremely limited, as will be seen from details on the pilot given below. The Third Party Evaluators developed a questionnaire (See Appendix, page A-7) that was designed to elicit as much information as possible bearing on the attainment of these objectives. However, the information on specifics is very spotty for reasons we shall make clear. What is unequivocal, however, from this very limited and poorly structured

and directed pilot test, was that the PROJECT CAREER data is indeed useful to teachers.

Pilot Schools and Students

The original PROJECT CAREER proposal specified that pilot testing would be conducted in an urban system, a suburban system, and a regional vocational-technical school system. In the Spring of 1972, the three LEA's were selected, with Springfield, Milford, and Blue Hills Regional Vocational-Technical School representing the three specified settings.

From the outset of the involvement with the LEA's, there were problems that affected the data development work of PROJECT CAREER and created poor relationships with the LEA personnel. By the time CAREER/CAN was funded, the pattern of the pilot tests was already established and the difficulties were part of the total history of PROJECT CAREER. These problems have all been evaluated in previous Third Party Evaluator reports, including one interim formative report on piloting that was part of the ongoing evaluation of this Project.

As a result of these tangled relationships, there were only two pilot teams operative at the Secondary level, one in Springfield and one in Milford, by July 1973, when CAREER/CAN began, and when a major summer workshop was held to being developing curriculum materials. Survey data were collected from a curriculum coordinator and a teacher in Randolph High School (a "feeder" school for the

Blue Hills Region). No actual pilot use of these data, however, was ever made in that school, and the information available from the surveys does not contribute anything to the evaluative data collected from Springfield and Milford. We shall therefore limit our reporting to those two systems.

Pilot Plan

The original pilot plan called for an interdisciplinary team approach in which the team leader or core teacher would be the occupational teacher and the other members of the team would be from academic disciplines. The occupational teacher would receive BO's for his occupational instructional area and the academic teachers would make their instructional inputs primarily from the pre-requisite skills and concepts columns.

The plan envisaged an intact group of students studying under the occupational teacher who would move as a group to the academic teachers on the team. This plan would enable the academic teachers to maximize the relevance of their subject matter for these students, since teaching would be based on the concept and skill learning directly tied to behavioral objectives being used by the occupational teacher. The relevance of this learning for career decision making would be further enhanced by a plan to relate the activity to the guidance component through the use of student inventory files. These files would constitute a running record of the specific occupational skills (job tasks) learned by the student. This skill

inventory would be computerized and serve as a basis for searching the data bank for all occupations to which that skill development would be relevant. This exploration component was to be facilitated through the development of Career Information Centers (CIC).

This is a very powerful and well developed model. However, a number of missing elements made it impossible to test and, from that point of view, insured the failure of the piloting.

- Complete four column objectives were never available at the outset of the pilot so that the teaching teams never had fully developed data with which to work.

- The plan to have the same students in both the occupational class and the academic classes could not be implemented in the pilot schools because of schedule difficulties. Therefore, the teamwork anticipated by the model could only be implemented in piecemeal fashion with only some of the students. No real impact of the interdisciplinary approach was possible to assess.

- Student inventory file forms were actually developed but they were never computerized. Because complete and systematic data were lacking and only implemented in the classroom on a spotty basis, the student inventory of skill development was meaningless and, to our knowledge, was never actually carried out by any students.

- Career Information Centers were established in the pilot schools, but their use was never integrated into the skill development process for the reasons outlined above. For the same reasons, there was never any meaningful interfacing between the pilot testing teaching component and the pilot testing guidance component of the pilot testing.

What, then, remained of the pilot effort that could contribute useful evaluative data bearing on the objectives of the pilot testing?

- Two occupational teachers received PROJECT CAREER data for occupations in their instructional areas and these data were used in their classrooms.

- The teams' academic teachers made conscientious and, in some cases, imaginative efforts to utilize PROJECT CAREER data, when available, in order to complement the instructional efforts of the occupational teacher. When data were lacking, the academic teachers developed their own materials that were faithful to the concept or intent of the data use.

From this effort, it was possible to extract some minimal, but useful, information as to the value of the data to the classroom user. Other than second-hand feedback from the teachers, no meaningful data could be collected relative to the impact on students.

Springfield Pilot

A young electronics teacher was the core teacher for the pilot project at Springfield Trade High School. His team was composed of a mathematics, physics, and English teacher. His final project report, detailing his experiences during the 1973-74 school year, provides excellent insight into how he and his team experimented with the use of PROJECT CAREER data. This report is included in the Appendix, page A-2 .

Computer printouts of several hundred electronics BO's were made available to the Springfield team. During the summer workshop, July 1973, they worked on the development of some learning activity packages (LAP's). These were to be implemented in the Fall. By all accounts, the LAP's were a failure, and after the first half

of the school year, further efforts in that direction were abandoned. The teachers reported that the students did not like the LAP's. The math teacher believed that the data for math-related LAP's was weak, in that it lacked higher mathematics concepts. The data was much better for physics, especially the pre-requisite skills and concepts columns.

The evaluators inspected the LAP's developed after the summer workshop and found them to be quite weak. The teachers reported that the promised technical assistance was never forthcoming and only the physics teacher was confident of his ability to write good LAP's. In any case, LAP's were not developed beyond that of the summer workshop. Those that were developed by the English teacher showed good imagination and creative potential, but there was no connection in any of these LAP's to PROJECT CAREER data.

Because of the aforementioned scheduling problems and the weaknesses in the available data, the piloting contributions of Springfield's academic teachers to the Project was limited. Again, we must emphasize that this result was not due to any failure of effort on the part of the academic teachers. Despite these problems and limitations, both the math and physics teachers report that the pre-requisite skills and concepts columns were a help in instructional planning. The physics teacher also found the component tasks and environments columns helpful. The quality of the data in these columns, however, was criticized especially by the math

teacher who found, for example, that he often did not agree with the level of mathematics prescribed by the four column writer for the electronics skill given in the objective. He gave the following example: "I may have felt that scientific notation was necessary, but the BO may only have addition and subtraction as a prerequisite. I felt this was very restrictive from my point of view." Obviously, this is a development problem, perfectly resolvable, and the kind of data development feedback which the Project needs to systematically collect.

When we look at the data from the point of view of the electronics teacher, however, we get a different picture. We must keep in mind that the data received by the pilot schools was "early data" that had not been fully developed, and had not been subjected to the later quality control procedures that purged the system of the worst of the initially developed BO's. Thus, what was pilot tested may be said to be of generally poor quality compared to what the Project was producing during the last six months.

The electronics teacher was clearly enthusiastic about the data, found some imaginative ways to utilize it, and declared that the printouts had become his "lesson plans" and made his job easier. In the judgment of the evaluators, the unhappy experience with the LAP's may have stemmed from the poor quality of the LAP's and the lack of the Project's supporting technical assistance to provide for their improvement. But this failure proved to open

the door for some serendipitous experimentation that revealed other possibilities for using the data in the classroom. We cite two examples briefly from this teacher's electronics class.

A four column BO was copied on the blackboard. Students read the objective and accompanying four column information. The objective was discussed to insure clarity of understanding. Students were then directed to complete the learning necessary to perform the task successfully. They could learn by any means they chose, using the class and equipment as a laboratory and the teacher as a resource. When they were ready to be assessed on the objective, they requested an evaluation from the teacher. In this approach, the objective was shared with the students and they designed their own learning activities and requested assessment when ready.

In another situation, the teacher provided the students with a radio needing repair. The students worked out the problem and the repairs, on their own, using the resources of the laboratory. After completing the task, they then were directed to the computer printouts of BO's and asked to search for performances that corresponded to those they had completed in their work on the radio. These were incorporated into written student reports. Thus, the learning moved from experience back to the identification of tasks learned. Organizing the learning experience was accomplished through the availability of the objectives.

NEESI's consultants feel that it is just such user experimentation that will eventually enable the Project to both improve the product and to develop user models that can be described and packaged for other users.

One final bit of reported feedback on the Springfield pilot is worth noting. The English teacher had some of the electronics students in one of her classes. She had developed some career exploration materials and activities, including some field trips to local industries. She found that, compared to the other students, the students from the electronics class made the best individual use of her role as a career information resource, and she felt that the linkage for this was due to her involvement as part of the teaching team using the electronics BO's. She was familiar with those BO's, and therefore could relate to the students who were working with them in electronics class. We view this as evidence for the potential of the product in fostering interdisciplinary teaching that is occupationally relevant.

Milford Pilot

The Milford core teacher was a business teacher. He received a few hundred BO's covering the following occupations: legal secretary, secretary, medical secretary, stenographer, file clerk, clerk general, clerk typist, bookkeeper, cashier, payroll clerk, and receptionist. On the team were teachers of physics, English, and social studies.

In addition to the scheduling problems which prevented the business students from being in the academic teachers' classes, there was an additional handicap in testing these data. The important concepts column from which academic teachers draw most of their teaching relevance for the occupations was blank on nearly all the BO's. In effect, there were no data for the academic teachers to work with. As a result, they were forced to invent material that might support the work of the business teacher.

The role of the physics teacher was the most difficult since the business students in the pilot test were only sophomores and could not take physics even if scheduling could have been arranged. In addition, as pointed out, there were no concepts with which any of the teachers could work. Each of the academic teachers, therefore, brainstormed their own ideas and developed some LAP's that were business related, but not really connected to the BO's.

One experience, quite different for Milford than for Springfield, was the success of the LAP's. PROJECT CAREER helped these teachers to "discover" LAP's, and they continued to develop them for their own classes. The physics teacher was quite active in this approach and reported that his students were highly enthusiastic over the physics LAP's. This can be regarded as a positive benefit from the pilot experience, but not a test of the PROJECT CAREER product.

As with Springfield, the only real product test came from the occupational teacher. Again there was unequivocal enthusiasm for the BO's. Compiling the responses from the questionnaire completed by the business teacher in Milford, we can provide the following information:

This teacher made fairly extensive use of the BO's in his classroom. He estimated at least 50 hours of classroom teaching time involved the PROJECT CAREER data. He developed several LAP's, each of which covered approximately seven BO's taken verbatim from the PROJECT CAREER printouts. He found the BC's to be precise enough to teach, and the performances relevant to in-school learning. The BO's were not organized and he would have preferred them in a sequence.

His selection of the BO's to teach was based on his own curriculum as well as what he felt was relevant to his students. He felt the BO's were "some help" in designing his instructional units. The pre-requisite skills column he found to be "a guide in fulfilling the behavioral objective." The component task column "broke down the task into helpful sequential tasks." The alternative environments column provided information on "the necessary tools to perform the tasks." There were not enough complete concepts columns to comment.

In general, this teacher commented that, "The BO's I used worked hand in hand with the textbook. I found the BO's very easy

to work with and also the students I feel enjoyed them much more than the routine textbook version." His recommendations for improving the product package included additional easily accessible support materials, and, for a full understanding of the program, an in-service training program for faculty members.

Here is this teacher's entire summary comment: "I feel that my experience with the BO's that PROJECT CAREER issued me were excellent and a dynamite experience not only for myself but from the students as well. I would, however, admit I did not receive enough of them from PROJECT CAREER possibly due to the lack of communication at times. In my particular component I would have to say that the business area being the core, seemed to work out the best. A possible reason for this could have been the structured time slots that the students were placed in, not allowing them the freedom needed to see any of the four teachers that they desired to see on any given day. The business aspect of the 'team' worked out the best because the business instructor was present at all times to discuss and work with the LAP's with the students. In general all four disciplines worked out relatively well and I would say that the program was a successful program."

Throughout our field interviews and surveys of all LEA pilot components connected with PROJECT CAREER, the Third Party Evaluators have found this enthusiasm for the PROJECT CAREER product. We believe this is a remarkable and encouraging finding since the

data were late in coming, not complete, of generally poor quality, and the direction and support given to the LEA personnel was sporadic, sometimes inconsistent, and not really adequate to the tasks that were expected of these personnel. From that perspective, there could be no more clear demonstration of the potential value of this product for occupational education.

A final example of the "success in failure" experience that seems to characterize the pilot testing of this Project comes from the Milford teachers. Since the pilot model required the cooperative teamwork of the three academic teachers with the business teacher, a number of discoveries were made. The business teacher,"discovered" the physics laboratory and developed a familiarity with it that, he said, enhanced his understanding of this part of the curriculum as well as that of his students. The academic teachers, forced to find (invent) ways of developing subject matter units of relevance to the business students (even when they did not have them in class) found themselves stretched in interesting new ways. They developed a "team sense" in working together and understanding each other's inputs into the education of their students. They reported that this had been an invaluable experience, and they wanted to continue it.

We find this kind of report to be salutary. For the Project, it substantiates the value of the academic/occupational team, not central to the pilot test at this stage of the Project, but still significant. It is the judgment of the evaluators that a great

deal of credit for these results belongs to the LEA personnel who accomplished them. The Project did, indeed, catalyze the experience, fund a summer workshop, and provide funds to the LEA's to carry out the pilot, but it offered much less than was promised.

SUMMARY OF FINDINGS

The evaluators believe that the following summary statements represent the most salient aspects of our summative evaluative findings relating to the objectives of PROJECT CAREER/CAN.

1. The PROJECT CAREER behavioral objective, with the additional four columns of curricular information added to the three part Mager objective, represents a significant and innovative advance for occupational education. The four columns have demonstrable instructional value, and they are readily transportable anywhere in the country.

2. As of the termination of this Project, the four column writing is not yet fully developed. Standards of quality control are still being developed. Additional manuals with important coding for full computer utilization remain to be developed. However, the production model, the training of writers, and the plans for developing the remaining manuals are complete.

3. As of June 30, 1974, a data bank of four column objectives for the 116 occupations in the PROJECT CAREER list is about 90% complete.

4. A sample data package for BO's in automobile mechanics indicates considerable variability in the extent and quality of information in the four columns. The two most variable columns were pre-requisite skills and component tasks. This finding is supported by the editors who report that these are the two most difficult columns to write. Completed manuals for these columns are also unavailable at this time.

5. Computer retrieval capability is now available for several useful configurations of data. The lack of coded information for three of the four columns still limits retrieval capability at this time, but that is not a limitation of the computer. Most users will be able to request data in some useful format and receive it within two weeks. Some standard "on shelf" items will be maintained.

6. A limited pilot test of the product in two LEA classrooms, with supporting help from academic teachers, indicated that the data has high positive impact on users. This finding emerged despite obvious weaknesses

in the data at were available for testing, as well as a host of other problems associated with the pilot testing. Feedback from the teachers indicates that the use of the data in classrooms also has good potential impact on students. The pilots, as conducted, did not provide for an adequate test of student impact.

To summarize generally, the Third Party Evaluators find that the Project has established the feasibility of this product being useful for classroom instruction and curriculum development in occupational education and supporting academic areas. As the product was developed through June 30, 1974, it is not ready for full scale use and dissemination. In its current "raw" form, the product has been improved in quality considerably over the Project's development life, but, as yet, there has been insufficient packaging development for users. Sequencing problems have not been dealt with, to cite a major remaining area of needed development. The four column information needs further refinement, quality control, and the completion of the remaining manuals which will contribute to the aforementioned needs.

With the improvements and further developments summarized above, the Third Party Evaluators feel that their findings would justify the conclusion that this BO product has the potential for high impact on users and student consumers of occupational education and that it will be fully transportable when further tested and developed.

VIII. RECOMMENDATIONS

The recommendations that will be listed here are brief and are inherent in the findings discussed above.

NEESI recommends:

1. That the Project not release any more data for testing until any batch to be released has been subjected to additional editing and any gaps in information have been filled.
2. That the Project give high priority to completing the final remaining development steps for the four columns, namely the completion of the remaining manuals and coding.
3. That upon the completion of the remaining four column manuals, the completed four column objectives be re-edited and coding added where missing.
4. That additional pilot testing be backed up with careful in-service training for the personnel conducting the test, that regular follow-up contact be maintained to monitor progress, and that adequate support personnel be made available to consult on instructional design development using the Project data.
5. That additional programs and configurations of data retrieval be limited until the initial retrieval programs can be tested for their feasibility and potential user demand.

6. That the Project made a major investment in developing a few alternative ways of sequencing and packaging the data in order to maximize the value and usefulness to potential users.

IX. COST EFFECTIVENESS

Cost effectivensss considerations may be encompassed by three basic questions:

1. What proportion of the resources were actually used to accomplish the objectives?

2. What were the overall finite costs in relation to the objectives accomplished (outputs)?

3. Were there alternative ways to accomplish the objectives that would have been more cost effective?

In order for evaluators to provide meaningful answers to any of these questions, at least two kinds of information are necessary:

- A program budget containing dollar amounts related to specific Project objectives.

- Accurate and complete fiscal information relating disbursements to objectives as well as line items.

Neither of these conditions was met by any component of PROJECT CAREER, with the exception of PROJECT CAREER/CAN which had a program budget.

There was an effort made during the last months of the CAREER/GUIDANCE project to institute budgeting by objectives for expenditures in each of the pilot LEA's. These budgets and related objectives were developed by the LEA's and submitted to the Project Administrator for approval. Disbursements were made based on the attainment of or contribution to the attainment of the local objectives. However, this constituted only a local arrangement with a

rather small proportion of the total funds expended by PROJECT CAREER. Moreover, the records necessary to monitor these disbursements were not summarized and would have required a "mini-audit" of requisition forms. In any case, the Third Party Evaluators want to commend the Project Administrator for this effort at instituting a more cost effective system.

Another difficulty with determining cost effectiveness for any specific component of PROJECT CAREER is the obvious fact that resources were interdependent such that it was impossible to separate out the effect of funding from one source from the effect on the same objective from another source. Central staff personnel seldom had single assignmen that focused 100% of their time on one objective for one Project component. Two examples will illustrate this fact.

The administrator of CAREER/HANDICAPPED devoted half or more of his time (variable at different stages of the Project) to activities that were related to the data development objectives of CAREER/DEVELOPMENT, yet his total salary was funded by CAREER/HANDICAPPED. The Curriculum Administrator for PROJECT CAREER was paid from CAREER/DEVELOPMENT funds, yet a major portion of his time was devoted to administering and directing the pilot activities associated with CAREER/GUIDANCE, and most of the last year of his work on data development was devoted to four column writing which was a funded objective under CAREER/CAN.

These problems of allocating resources to specific Projects with particularized objectives become even more complicated when we consider resources going into supplies, equipment rental, administrative costs, etc. As we pointed out, neither the fiscal records nor the budgets enabled any meaningful distinctions to be made in allocating resources.

Such data on expenditures as was available to the evaluators in summary form (apart from actual vouchers and requisitions) consisted of two categories:

1. An auditor's report on expenditures for all components of PROJECT CAREER from July 1, 1971 through March 19, 1973.

2. Bi-weekly fiscal reports from the accountant for all components based on a fiscal 1974 budget. The latest of these reports, dated June 18, 1974 formed the basis for final figures on Project expenditures.

We reported elsewhere on the fiscal management difficulties that beset the Project during its first two years. The auditor's report, dated June 22, 1973, contains the following statement: "At the Project office, internal control of expenditures, proper classification of charges, communication of financial data to Regional School business office, and audit trail of financial transactions to the accounting records was inadequate in many respects. These deficiencies are noted below through recommendations for improvement of the accounting system."

The improvements were implemented by late April, 1973, but there was still a lack of budgeting and disbursement by objectives

and over $600,000 had already been spent. Thus, tracing the effect of money spent during the first two fiscal years of PROJECT CAREER became almost impossible. An illustration of this problem can be made for CAREER/GUIDANCE.

According to the June 1973 auditor's report, $112,003 was expended from the CAREER/GUIDANCE budget through March 19, 1973. However, when the new line item budget for fiscal 1974 was drawn up and bi-weekly reports begun, the CAREER/GUIDANCE budget was drawn on the basis of the total funding for this Project from its inception in July, 1972. Expenditures from the months preceding fiscal 1974 were reallocated, apparently, to take account of the fact that this budget had been tapped for funds needed by other components, but which had not been available to PROJECT CAREER when expenditures were due. Thus, the audit shows almost $66,000 expended for personnel at the Central Staff level, but the final CAREER/GUIDANCE budget accounts for only $34,000 to Central Staff personnel. Thus, any spending prior to the last fiscal year of this Project cannot be accurately accounted for in relation to progress on attaining the objectives of this Project.

In the opinion of the Third Party Evaluators, the funding agencies are as much to blame for this state of affairs as is the Project administration. For some reason, the funding agencies did not insist on a program budget at the time the proposals were made

or as a condition for the release of funds. (The exception to this was PROJECT CAREER/CAN).

This leaves only the possibility of the most gross estimates of cost effectiveness. For this purpose we have combined information on expenditures for all components of PROJECT CAREER into one chart, Figure 2. We have, in turn, lumped all objectives into two categories, 1) data development and 2) pilot activity. We have further arbitrarily assigned all expenditures for personnel, supplies, etc., that were essentially made at the Central Staff level to the objective of data development. Under data development we include the completion of 8-part objectives (condition, performance, extent, prerequisite skills, component tasks, alternative environments, concepts, handicapped code) for 116 occupations and all necessary computer time, programming, and output. This arrangement also assumes that 100% of the time of staff was going into data development, an assumption that is obviously not true. We then identified all the funds that were expended directly to or for LEA personnel and their travel expenses. This money we assumed represented the contribution of resources to the pilot activity. This assumption is also not true since a portion of supplies, equipment rental, administrative costs, etc. can certainly be assigned to piloting. In the absence of any other basis for sorting out these costs, however, we have made this gross allocation.

Figure 3

PROJECT CAREER EXPENDITURES THROUGH JUNE 10, 1974

EXPENDITURES ONLY

	CAREER DEVELOP-MENT 71-72	CAREER DEVELOP-MENT 72-73	CAREER DEVELOP-MENT 73-74	CAREER DEVELOP-MENT Total	CAREER HANDI-CAPPED 72-73	CAREER HANDI-CAPPED 73-74	CAREER HANDI-CAPPED Total	CAREER GUIDANCE 72-74	CAREER CAN 73-74	TOTAL ALL FUNDING
1. TOTAL BUDGETED	154,857	199,908	224,110	577,875	255,042	166,366	421,408	194,120	207,512	1,400,915
2. TOTAL EXPENDED	154,857	160,764	216,554	532,175	140,524	119,636	260,160	181,437	149,680	1,123,452
3. PERSONNEL	113,345	119,606	145,794	378,745	75,061	59,619	134,680	34,349	111,305	659,079
4. SUPPLIES, EQUIPMENT, ETC.	41,512	41,158	56,623	139,293	18,018	33,374	51,392	34,596	38,375	263,656
5. DATA DEVELOPMENT, #3, #4	154,857	160,764	202,417	518,038	93,079	92,993	186,072	60,945	149,680	922,735
6. LEA SALARIES AND TRAVEL	—	—	14,137	14,137	47,445	26,643	74,088	112,492	—	200,717
7. FIELD TESTING, #6	—	—	14,137	14,137	47,445	26,643	74,088	112,492	—	200,717

As can be seen from the chart, the bulk of funding for data development came from PROJECT CAREER/DEVELOPMENT and PROJECT CAREER/ [illegible]. Major funding for piloting came from PROJECT CAREER/HANDICAPPED and PROJECT CAREER/GUIDANCE. Of the total $1,123,542 expended by the Project through June 18, 1974, nearly $923,000 went to data development and a little more than $200,000 went to piloting.

COST EFFECTIVENESS QUESTIONS

Was a proportion of PROJECT CAREER resources were used to accomplish the objectives of all Project components? In studying all the reports on expended funds that were available to us, we must conclude that there is no evidence to suggest that any part of the resources of this Project were spent for other than the attainment of Project objectives. The failure to budget by objectives makes it impossible to identify where or to what extent this conclusion might not be true. There is other evidence discussed below, however, that indicates not all the pilot test resources went into the specific objective of testing the data.

What were the overall finite costs in relation to Project objectives or Project output? We can say from our gross figures that it cost over $900,000 to develop a data bank that we estimate to be about 90% complete in the form originally proposed when the Project was funded in July, 1971. The original funding proposal, in which the development of this data bank was proposed for

completion over the three year period was funded to the extent of $577,875. Over $400,000 had been spent on data development from all funding sources by the end of fiscal 1973 (two years into the three year funding period). At that time the data bank included about 550 completed objectives. There were also several thousand objectives at various other stages of the data development system. Also at this time the Project was working with the explicit target of 50,000 objectives in the data bank. In the opinion of the evaluators this was never a realistic figure and should be essentially discounted in looking at the accomplishments of the Project and the issue of cost effectiveness. But, from the point of view of the stated objectives of the Project, the figure was there and certainly created an enormous gap between production and target.

During the last twelve months of the Project, about $150,000 in new development money was spent from PROJECT CAREER/CAN. This was added to about $200,000 of remaining data development in CAREER/DEVELOPMENT and another $100,000 drawn from CAREER/HANDICAPPED and CAREER/GUIDANCE. So, by our gross figures, about another $450,000 went into data development during the last fiscal year of the Project. The results were the addition of about 9,000 more completed BO's for the data bank and an additional three to four thousand BO's in the system needed to complete all 116 occupations.

Was PROJECT CAREER cost effective in producing this data bank of completed behavioral objectives? The answer is probably "yes and no." We can say that the data bank was completed as promised in three years and that it cost approximately $923,000 of a total budget from all sources of $1,400,915. That is probably acceptable for a research and development project breaking new curricular territory to develop a product that will be nationally transportable with high potential impact on users and student consumers.

On the other hand, the proposal to develop this product was funded for $ 77,875 for a three year period and some of those resources had to be used to secure nearly $400,000 more dollars in order to complete the data. It did, in fact, require two years and $400,000 to learn how to produce a product that would have reasonable quality and be useful for instruction. A similar amount of money ($450,000) and one more year, was then required to complete the data bank for about all 116 occupations on the PROJECT CAREER list.

For any reasonably definitive answer to the cost effectiveness of this Project we must turn to our final question. Were there better ways to accomplish the objectives that would have been more cost effective? To this question, the evaluators believe the answer is a qualified yes. In this context we must look at the second of the two major objectives, the pilot testing of the product.

Our gross figures indicate that about $200,000 was spent over a two year period to pilot test the usefulness of the data. Were the data ever pilot tested? The answer to this question is essentially no. Classroom use of the data was limited to two occupational classrooms using incomplete data for two occupational clusters (electronics and business). No data bank with any of the computer retrieval possibilities was ever available for piloting. Data was never available in the form and quantity needed to effectively test its use in guidance. Coded data for handicapped populations was never available in the quantity and quality needed for an adequate test.

The undenied accomplishments of the pilot programs in the three LEA's and the enthusiasm for the potential of the product (the feasibility of which was certainly tested), cannot obscure the fact that the data were never addquately ready for the testing that was to take place. We can say, then, that most of the resources going into the pilot programs were not focused on the essential objective of testing the usefulness of the product for guidance, for the secondary classroom, and for special needs populations.

This problem, moreover, was extended to the data development process. Pilots that had no data had to be kept going on some basis. We have no way of knowing, however, to what extent data development resources were wasted by the poor timing of the pilot programs.

We do know that the funding sources that produced money for the pilot test also added resources available for data development. Were the exigencies of proposal writing and the requirements of the funding agencies such that to get more money for data development piloting had to be included? The answer to this question is probably yes.

In closing we want to emphasize that the start up costs of a project of this magnitude are bound to be high. In our judgment, the costs of this Project were fully warranted in relation to the innovations developed. By concentrating these funds on one project, a process and a product have been developed that can now be duplicated by local school systems throughout the country at a small fraction of these original development costs.

X. CONCLUSION

PROJECT CAREER/CAN was funded July 1, 1973, and in June, 1974, was evaluated on its three major objectives which were to complete the addition of four columns of information to the PROJECT CAREER behavioral objective, to computerize these data for effective user retrieval, and to pilot test the use of the product in the classroom. All of these objectives were inherited from ongoing components of PROJECT CAREER that began twelve to eighteen months before this Project was funded. The funding from this Project was entirely directed toward the first two objectives, with the third objective allowed to continue on its own from previous funding. The evaluative findings substantiate that the first two objectives were effectively accomplished and the product at this point is about 90% complete. A sufficient data bank has been established to warrant further testing. The pilot test established the feasibility of using this product in the classroom, but was too limited and ineffectively monitored to provide more than rudimentary data for further product development.

A P P E N D I X

PROJECT CAREER/CAN FOOTNOTES

1. PROJECT CAREER in Motion Addendum
   June, 1973

2. PROJECT CAREER Comprehensive Project Plan
   September 1, 1972, page 1

3. Ibid, Pages 1-2

4. Ibid, Page 2

Allan Epstein
May 16, 1974

PROJECT CAREER REPORT
SPRINGFIELD SECONDARY PILOT

Beginning in September of 1973, the teachers involved in the PROJECT CAREER Program began to use the Learning Activity Packages that had been developed the previous summer.

The bulk of the information provided on the data sheets was well organized and relevant to the objectives of the program. It was with the method of imparting the information that we ran into difficulty.

For the first five months we used the learning activity method. There were various problems that arose specifically from this format.

From the very beginning, there was a problem rotating the other three teachers into the electronics class. Therefore, the main aim of relating certain aspects of the four columns with electronics became very difficult. The needed reinforcement of any relationships became ineffective.

Perhaps the original plan to coordinate the classes would have been more effective. However, this alternative method of having rotating teachers on an irregular basis (in the electronics class) along with the regular science, math, and english classes was viewed by the students as an unfair overloading of their schedules.

From a teaching point of view, I found the L.A.P. method left little room for variation and I became bored with the routine. Close contact with the students became difficult as most material was self-taught. The close contact with the student was threatened.

Lastly, the time involved in preparing the L.A.P.'s and the execution of the lesson by the students was too long for the amount of material covered.

Upon discussion with the other group members, it was decided that although the behavioral objectives were valuable, the methods suggested were proving unsuccessful with these students. The format that we adopted is what follows.

A behavioral objective from the data given us was placed on the board and discussed. Classwork was taken from school workbooks and textbooks. That helped to develop the particular objective. If it became apparent that a student was having difficulty with a certain algarithym, the subject teacher was notified and the student was given help. In this way the science, math, and english teachers became resource teachers and they were able to work on an individual basis with the students. The students seemed to respond better to more teacher involvement, rather than the impersonal method of self-teaching.

Guest speakers and field trips were used to reiterate the relationships mentioned in class. Some of the guest speakers were I.B.M., Digital, and Hamilton Standard.

As a further step we began to use the textbooks only as a reference book along with instruction manuals and schematics. The class was broken into subgroups. In each subgroup I arbitrarily assigned a foreman with whom the others learned to cooperate. These groups were then assigned projects which involved not one but many behavioral objectives. The projects were formed by grouping various objectives from the data sheets to form one task. Some of the tasks included building a transistor radio, building a tube radio, setting up a television antenna with a rotor, building an electronic calculator, or changing a color television picture tube. Each of these projects can be viewed by the student as being essential to anyone going into the electronics field. At the same time, the instructor can feel that necessary objectives have been met. Let us take two examples.

In building a tube or transistor radio, the following objectives from the data sheet can be applied: 004913, 004914, 004915,004918, 004917, 004924, 005174, 003115, 003114, and 1983.

In changing and aligning the tube of a color television and checking the circuits, the following objectives could be applied: 003115, 001982 001981, 001973, 001970.

When each task was completed, a technical report was written by each student in the group. All applicable behavioral objectives were listed and discussed, and the outcome of the project was delineated. Some of these reports are included.

The students became enthusiastic about learning while doing. They were tired of learning theory. Now they could see why theory was important, first hand. Often, after completing a project, the group would look through the scan sheets and pick out objectives that they had mastered. They had to know the theory to use the equipment and to put the pieces of a project together. This was far more realistic to them than learning theory to pass a test. Their interest in going back to the scan sheets to dissect what they had and to try and further understand the proce.s involved reinforced my belief that this method was valuable.

There is no doubt that some of the drawbacks I have mentioned reflect to some degree my own inadequacy. The procedure originally decided upon could have been more effective if a more experienced teacher had written the L.A.P.'s. Some of my L.A.P.'s were, indeed, boring.

To some extent, my lack of experience reflected in my ability to organize the other teachers involved into an effective unit.

My inexperience, along with other drawbacks, could have been minimized if there had been more direction from the PROJECT CAREER Program. Field trips which were to be planned to afford us the opportunity to observe other schools engaged in this program never materialized.

Most of the time we were left on our own to make decisions and to criticize our own programs. We were not observed by anyone

who could give any constructive criticism to our methods, or provide another view of which we were not aware.

I feel the program has invaluable material to work with. Having dealt with it all for a year, I am in a better position to arrange a program for next year. It would be a shame to disband now when we have gathered much of the missing ingredients, the experience, and wisdom to use the very valuable material that has been compiled.

Subject Area_____

SECONDARY TEACHERS SURVEY

The general objective of Project CAREER is to produce skill based occupationally oriented behavioral objectives for use in curriculum and instruction in the school. This is a simplified objective and there are other related objectives, but for purposes of this evaluation that will suffice.

In order to determine whether this BO product is of value to instruction and curriculum development, the product was to be tested in several schools using interdisciplinary teams of teachers. Preliminary evaluation has made it clear, and Project CAREER agrees with this evaluation, that the product that has been sent to the schools for piloting was not completely adequate. This evaluation takes into consideration this fact.

Basically, what we are primarily interested in finding out on this survey is the extent to which you were able to make direct use of the product you received, and what problems and successes you experienced in trying to use the product for curriculum development and/or instruction during the 1973-1974 school year.

We feel that you can respond more completely if we give you open ended questions, even though this will be more time consuming. We hope that your interest in and commitment to the success of the Project will be sufficient motivation to answer these questions as frankly and fully as you can.

1. Describe the extent to which you were directly involved with using Project CAREER BO's (on computer printouts) for developing classroom instruction plans or developing an overall curriculum unit for one or more occupational areas. You might roughly estimate the proportion of your total school teaching time this year that you devoted to either developing or directly teaching from PC developed BO's.

(over)

e) If they were randomly organized, did you attempt to sequence them? What kind of system did you use for sequencing them, if at all?

f) Did the BO's you received all have the four columns of information added?

g) Would you say that if you had set out to design some instructional units for the same occupational skills that you could have done as good a job without the 12 BO's as you were able to do with them?

3. If you received a batch of BO's that had the four columns added, please respond to these questions regarding your use and the usefulness of each of the four columns.

a) In your instructional planning was the pre-requisite skills column a

help hindrance of no usefulness (circle one)

Explain how you made use of the pre-requisite skills column in your planning.

(over)

4. If you actually had the experience of teaching one or more of the PC BO's, describe what success or difficulty you had. What specific improvements in your instruction, if any, resulted from having the BO's?

5. What specific recommendations would have for Project Career to improve their product as it now exists so that users like yourself would not only find it of great help, but would be enthusiastic about incorporating these BO's into your instructional planning?

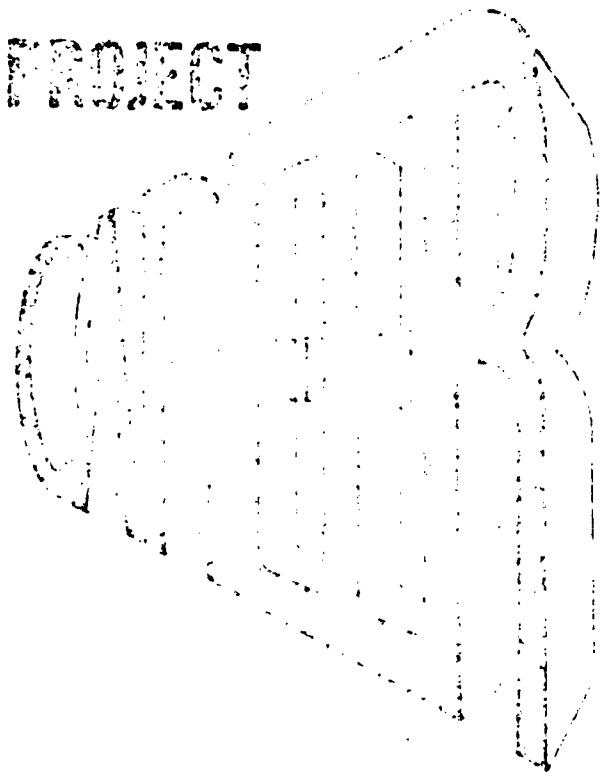
Here are just a few ideas for you to consider: written manuals or instructions on how to use the materials; in-service training on teaching from BO's; format revisions (specify); additional support materials (suggest some); etc.

6. Would you describe yourself as a teacher or curriculum planner who "believes in" the value of behavioral objectives as a sound basis for instructional planning? If not, what is your position or feeling about the usefulness of BO's?

(over)

The Commonwealth
of Massachusetts

Department of Education



Editors' Manual
4-Column Development

Prepared and Developed by:

Roger W. Ritch
Curriculum Administrator

With The Assistance of:

Gary Tirone
Bob Tyrrell
Peter Pettengill

June, 1974

Project CAREER
Vincent P. Lamo, Director
301 North Main Street
Randolph, Massachusetts 02368

It is the responsibility of the editor to be sure that all 4-column sheets reflect proper guidelines before being submitted for computerization.

Part 1

Guidelines relative to all 4-Columns.

1. Check that the proper I.D. No. is on each sheet.

2. Be sure that only one letter or character (including punctuation) is entered in each block, except for the fraction ½ which may be placed entirely in one block. The editor must also check to see that one blank box is left between each word or number.

   Example:

A	N	S	W	E	R	=	2	,	½	.	O	R	1	/	4	

3. When more than one line is needed for a statement, the editor should check that each line after the first is indented one space.

   Example:

I	N	D	E	N	T	O	N	E	S	P	A	C	E	W	H	E	N	U	S	-	
	I	N	G	A	N	O	T	H	E	R	L	I	N	E								

4. The editor should be sure that all words which must be continued to another line are separated by a hyphen.

5. The editor must determine that both proper grammar and punctuation are used by the writer in all 4-columns.

6. The editor must check for spelling errors.

7. The editor must be sure that any abbreviations used are either trade abbreviations or are universally accepted. (Writers are encouraged not to use abbreviations when at all possible.)

Content Problems

Content problems are not the job of the editor to solve. However, when editing the 4-columns, continuity or consistency problems do arise. For example, the pre-requisite learning column might have "ability to use a drill", yet, no indication of using a drill is mentioned in the component task and/or the performance. Changes should not be made without first consulting the original 4-column writer.

Part II

Guidelines Relative to Each Individual Column

Pre-Requisite Learnings Column:

1. The editor must make sure that each 4-column writer has put "ability to", "use of", or "knowledge of" before each statement.

2. If a pre-requisite math skill is taken from the Math Skill Inventory, the editor must be sure that the proper code number has been inserted in the spaces provided on the computer grid sheet.

3. The editor must check for prerequisites covering occupational, mathematical, scientific and communication skill competencies

Component Tasks Column:

1. The editor must check to see that each component statement begins with an action verb and is written in a concise statement rather than a narrative form.

2. Component tasks should be checked to see if the steps have been properly sequenced.

Environment Column:

1. The editor must check to be sure that commercial names are not used.

2. Each tool or piece of equipment should be listed individually on a separate line and checked to see that it is in accord with the condition, performance, and component tasks.

3. One line should be skipped to distinguish environment and alternate environment sections.

Concepts Column:

The editor should check to ensure that the proper code number is being used with the given concept and that the code number is correctly inserted in the spaces provided on the 4-column computer grid sheet.

Part III

Guidelines For 4-Column Editorial Follow-Up

Purpose:

The purpose of the 4-column editorial follow-up is to maintain a tight quality control over the work of the 4-column writer. By contacting each writer, whether it be by telephone or through the "4-Column Editorial Comment Form", the mistakes are held to a minimum. This will ultimately make the writers job easier, as well as increase the production rate of the completed 4-Columns.

Mechanical Editing Procedure:

When using the "4-Column Editorial Comment Form", the editor will abide by the following procedures:

1. Insert the writers name in the space provided on the sheet.

2. Indicate the problem location by checking one or more of the boxes labeled: Form, Column I, Collumn II, Column III, or Column IV.

3. Indicate the specific problems in the area labeled "Editors Comments".

4. Number each individual problem if more than one problem exists.

5. Place his/her signature and date in the space provided.

6. Copy the completed "4-Column Editorial Comment Form" so both the editor and writer have copies.

One to One Follow-Up with Technical Writers:

After a problem in the writer's work has been discovered and properly recorded, the editor should do the following:

1. Make an appointment to meet with the writer.
2. Supply the writer with a copy of the 4-column editorial comment form.
3. Discuss the various problems with the writer, so that he can fully implement your suggestions in his future work.
4. Fill in the date on which the writer has been contacted.
5. Make any additional notes which are deemed necessary.
6. File the original copy in the writer's folder for future use.

Sample 4-Column Products Attached:

1. A completed 8-part Project CAREER Performance Objective
2. Four completed grid sheets.
3. A 4-Column Editorial Comment Form.

I.D. 002711 Batch = 0011 DOT = 620381 Auto Service Mechanic Handicap = Yes
Inst-Prog. 170302 Automobile Mechanics 4-Column = 1234

Objective: Major Responsibility: 3 Duty No.: 0 Domain: 1

CONDITION: Automobiles with a noise in the muffler, new muffler, clamps, kit of tools and instructions

PERFORMANCE: remove and replace the muffler and clamps

EXTENT: within one hour without objective noise from the muffler

Objectives are coded "Attainable as Stated" by - (A), "Attainable with Modification" by - (M).

Hearing Imp.	Mentally Retd.	Visually Imp.	Speech Imp.	Physically Impaired					Emot. Disturbed	
HD-HG Deaf	Emr Tmr	Pt-St Blind		1-leg	1-arm	hemi.	para.	quad.	Mod.	Sev.
( ) ( )	( ) ( )	( ) ( )	( )	( )	( )	( )	( )	( )	( )	( )

PRE-REQUISITE LEARNING	COMPONENT TASK	ENVIRONMENT	CONCEPT
Use of lift	Lift car	Wrenches	Alignment
Use of wrenches	Unfasten bolt fastening	Portable stand	Seal
Use of impact hammer	pipes together	Impact hammer	Torque
Ability to read and understand instructions	Use impact hammer to free rusted joints	New hardware	Corrosion
Knowledge of corrosion	Remove muffler from hangers, and new hardware	Lift	Oxidation/reduction
	Lower car	Car (student's if possible)	Flexibility
	Run car	Equipment manufacturer's muffler training program	
	Inspect for leaks and noises		

ID — NO

0	0	2	7	1	1

PRE-REQUISITE LEARNINGS

COLUMN 1

USE OF LIFT	01
USE OF WRENCHES	02
USE OF IMPACT HAMMER	03
ABILITY TO READ AND UND-	04
ERSTAND INSTRUCTIONS	05
KNOWLEDGE OF CORROSION	06
	07
	08
	09
	10
	11
	12
	13
	14
	15
	16
	17

CODE ← WRITE ONLY IN THESE SPACES →

ID — NO

0	0	2	7	1	1

COMPONENT TASKS

COLUMN 2

				L	I	F	T		C	A	R															01
				U	N	F	A	S	T	E	N		B	O	L	T		F	A	S	T	E	N	I	N	G	02
					P	I	P	E	S		T	O	G	E	T	H	E	R									03
				U	S	E		I	M	P	A	C	T		H	A	M	M	E	R		T	O				04
					F	R	E	E		R	U	S	T	E	D		J	O	I	N	T	S					05
				R	E	M	O	V	E		M	U	F	F	L	E	R		F	R	O	M		H	A	N	-	06
					G	E	R	S																			07
				R	E	F	I	T		W	I	T	H		N	E	W		M	U	F	F	L	E	R	.	08
					N	E	W		H	A	N	G	E	R	S	.	A	N	D		N	E	W				09
					H	A	R	D	W	A	R	E															10
				L	O	W	E	R		C	A	R															11
				R	U	N		C	A	R																	12
				I	N	S	P	E	C	T		F	O	R		L	E	A	K	S		A	N	D			13
					N	O	I	S	E	S																	14
																										15
																										16
																										17

CODE ← WRITE ONLY IN THESE SPACES →

ID – NO

0	0	2	7	1	1

ENVIRONMENT

COLUMN 3

				W	R	E	N	C	H	E	S															01
				P	O	R	T	A	B	L	E		S	T	A	N	D									02
				I	M	P	A	C	T		H	A	M	M	E	R										03
				N	E	W		H	A	R	D	W	A	R	E											04
				L	I	F	T																			05
				C	A	R		(	S	T	U	D	E	N	T	'	S		I	F		P	O	S	S	-	06
					I	B	L	E	)																		07
																										08
				E	Q	U	I	P	M	E	N	T		M	A	N	U	F	A	C	T	U	R	E	R	'	S	09
					M	U	F	F	L	E	R		T	R	A	I	N	I	N	G		P	R	O	G	-	10
					R	A	M																				11
																										12
																										13
																										14
																										15
																										16
																										17

CODE ← WRITE ONLY IN THESE SPACES →

ID — NO

0	0	2	7	1	1

COLUMN 4

U	1	0	0	A	L	I	G	N	M	E	N	T																01
A	0	7	3	S	E	A	L																					02
B	0	5	9	T	O	R	Q	U	E																			03
C	0	2	0	C	O	R	R	O	S	I	O	N																04
G	0	6	9	O	X	I	D	A	T	I	O	N	/	R	E	D	U	C	T	I	O	N						05
H	0	1	1	F	L	E	X	I	B	I	L	I	T	Y														06
																												07
																												08
																												09
																												10
																												11
																												12
																												13
																												14
																												15
																												16
																												17

CODE ← WRITE ONLY IN THESE SPACES →

4-COLUMN EDITORIAL COMMENT FORM

Name (of Writer): John Doe

Comment on: [X] Form [ ] Column I [ ] Column II [ ] Column III [ ] Column IV

Editors Comments: 1. Please use pencil. 2. You must use a hyphen when you continue a word from one line to the next. 3. All fractions, except for ¼" must be written like this: [1][/][3][2]["]

Name (of Editor): Bob Tyrrell

• •

Today's Date: 5/30/79

Writer Contacted on (Date):

Notes:

PROJECT CAREER
301 North Main Street
Randolph, Massachusetts

General Instructions
"4-Column Development"

Commonwealth of Massachusetts
Department of Education
Division of Occupational Education

10/18/73

PRE-REQUISITE LEARNINGS

In order to keep the scope of pre-requisite learnings under control, the following scheme should be adhered to by the development teams:

1. Limit the pre-requisite learnings to the areas of math and/or science; communications (Reading/English); and the occupational specialty.

2. The pre-requisite learnings listed should be those which cumulatively relate the highest level pre-requisite in a given area needed for the performance of the behavior.

Example:

Conditions:	Given a radial arm saw and a piece of 1" x 8" x 48" stock
Performance:	Cut a compound miter of 25 degrees of angle and 15 degrees of bevel
Extent:	Within ten minutes

Pre-Requisite Learnings

1. Identification and measurement of angles
2. Use of protractor
3. Use of sliding "T" bevel
4. Use of radial arm saw
5. Ability to measure accurately ± 1/8"

COMPONENT TASKS

Component tasks are ordered according to performance sequence. Each column becomes an ordered task analysis of the listed behavior and as such should reflect the activities which are imperative for the successful completion of the listed behavior

For the sample objective listed above, the following may represent the sequence of tasks to be done pursuant to its completion:

Component Tasks

1. Set "T" bevel
2. Mark stock
3. Select proper blade
4. Adjust arm of saw to 25 degrees
5. Adjust rotor reading to 15 degrees
6. Position stock on saw
7. Don safety glasses
8. Take trial nick and confirm accuracy

Where possible, cluster items in the component tasks column in order that we might save time. (Example: if for the above list of tasks, #6 can be assumed to be a task which requires doing task #1 - #5, then we need only put down #6 - Position stock on saw).

The "Component Tasks" column is developed by the team member representing the occupation which relates to the listed behavior. It would appear, at this point, that other team members would have minimal input.

If there should exist, for a given behavior, more than one sequence for completing the behavior, the sequence which most closely relates to current practice should be included.

ENVIRONMENT

The "environment" column represents a listing of needed tools and media as wel as alternative devices and settings which may be more conducive in enhancing the learning of a particular student. As such, the column should have the inpu of all members of the development team, but especially the occupational instructo who knows the required materials, etc., and a media specialist who can assist t team in the development of alternative environments.

The "environment" listed for the above examples is:

Environment

1. Stock
2. Protractor
3. "T" bevel
4. Radial arm saw
5. Safety glasses
6. Pencil
7. Cross cut blade

Alternative environments might well be added to the list, such as cooperative education; a specific programmed text; certain multi-media presentations; simulation; etc. Therefore, we might add:

8. Use of assembly line environment
9. Film on mass production

CONCEPTS

The "concepts" column represents the efforts of the development team to provide those abstract rules, laws, generalizations and principles which are related to behavior. They will also facilitate the transfer of learning and an interdisciplinar approach to instruction. It is designed to take a student from the concrete to the abstract relative to a given behavior.

The column will represent the inputs of the science and/or math team members working closely with the occupational specialist.

In developing the concepts, the team should include only those concepts which are directly related to the listed behavior.

A. While we are primarily involved with concepts in the areas of math and/or science, you may, where appropriate, include concepts relating to law, economics, etc.

For the performance objective being used as an example, the concepts column would contain the following:

Concepts

1. Friction
2. Thermal Conductivity

For a behavior in office occupations dealing with the typing of a will, the concepts column might include:

1. Probate
2. Will and Testament

B. Concepts should meet one or more of the following definitions.

Law: A rule derived from or a generalization of observed phenomena and experimental facts (Law or Conservation of Energy)

Principle: A scientific theory, fact, or law of wide application (Archimedes Principle)

Generalization: The result of generalizing: a notion, rule or law derived by analysis of individual examples or instances, a general inference, an induction. (Gas Pressure) or (Classification)

Rule: A statement which belongs to the ordinary course of events or condition of a thing. That which may be expected, in the majority of instances. (Brownian Motion) or (Equilibrium)

Idea: Any object of the mind existing in thought, a concept, notion or mental impression; a formulated thought. (Color Filtration) or (Speed)

If these definitions do not apply to your conceptual statement, your statement does not belong on your list. If your statement does meet any of the above requirements, test it by answering the following questions:

(1) Is your statement of a concept clear enough for instructors in different (instructional/technical) subject areas to understand? Would your statement be misunderstood or misinterpreted? Is the idea clear? Rewrite statement if necessary.

As an example, a statement such as - "Brake fluid helps transmit motion of brake pedal to brake shoe" - has meaning to automotive specialists. If it were expressed as "non-compressibility of fluids" it has conceptual meaning in other instructional areas.

(2) Are there any other related ideas or concepts that mean the same thing in this case? If you find a better statement, use it.

Example: We notice that in cutting our board, heat is generated. Many statements can describe this: heat, heat energy, friction, heat transfer, 1st law of thermodynamics, conservation of energy. Of these, the word "friction" is more specific and this would be used.

(3) Could you condense your statement into one or two words? If so, do so.

Example: Frictional heat becomes Friction and
Conduction of Heat Energy becomes Thermal Conducitivity.

(4) Refer to a Science/Math dictionary.. Does your concept mean what you think it means?

Example: Conductivity alone means other things (i.e. electricity), but by defining it as thermal conducitivity any ambiguity is eliminated.

DATA FORMAT INSTRUCTIONS

Write in the I.D. number of the behavioral objective with which you are working. This is the 6-digit number to the left of the behavioral objective.
Example: ID-NO

0	0	2	7	9	2

Indicate in the space assigned, that column which you are writing, using the following codes:

1 = Pre-requisite Learnings

2 = Component Skills

3 = Environment

4 = Concepts

Example: (If you are working with "Environment")

Column | 3 |

Write only to the RIGHT OF THE DOUBLE LINE. Leave spaces between words; start each new item on a new line, and indent by one space if and when you need a second line for an item.

Please make every effort to be legible, as the work you do will be read directly into a computer.

NOTE: On the computer printout, mark to the right of the specific behavior the number(s) of column(s) completed for the behavioral objective.

Use no more than one sheet per column.

DEFINITIONS

Pre-Requisite Learnings:

Those skills, knowledges, understandings and attitudes which are necessary for a student to possess in order to facilitate the acquisition of the new behavior and which will not be taught during the treatment.

Component Tasks:

The individual activities which are necessary for the completion of the listed behavior when that behavior must have component tasks performed in sequence.

Environment:

The alternative environments which may be utilized for acquisiton of the listed behavior, i.e. - media, mode of instruction.

Concept:

The abstract rules, principles, laws, and/or generalizations which are related to the performance of the listed behavior. These are listed for purposes of providing for the transfer of learning and an inter-disciplinary approach to instruction.