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ABSTRACT

The paper describes the design of an Experience Based Career Education program (EBCE) in West Virginia, a program designed to provide high school juniors and seniors with systematic and coordinated experiential learning. The basic design strategy consists of a matrix that establishes workable relationships among elements of the system design, allowing flexibility in the entries on each axis of the matrix. Five design phases (conceptualization, design, development, production, and implementation) relate graphically to 12 design steps (feasibility study, content requirements, identification of resources, outlining activities, relating activities, outlining learning units, locating learning stations, locating resource centers, outlining learning plans, procuring resources, writing learning plans, and developing a record system). Throughout the design process, it is possible to revise content of the axes to meet operational requirements of the program. The paper includes a bibliography, charts, and diagrams. (MDW)

MATRIX ANALYSIS: A PRAGMATIC APPROACH TO CURRICULUM DESIGN

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Presented at the American Educational Research Association Convention,
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CONTENTS

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Introduction:

In December, 1971, the Appalachia Educational Laboratory (AEL) was awarded a planning grant to explore the possibility of establishing an Experience Based Career Education program in Kanawha County, West Virginia. In May, 1972, a contract was signed with the U.S. Office of Education for the development of an operational EBCE program. AEL's program had to meet the definition of Model II Career Education and its characteristics had to include:

- The locus of student activity carried out in the community.
- Career Exploration and Career Decision-making had to result from first-hand involvement by the student with careers.
- Integration of academic studies with community experiences was to be offered to each student to the maximum extent possible.
- Each student was to receive an Individualized Program of study to ensure the widest possible range of career exploration and career choice. Students were not to be tracked or channeled into careers or programs of study because of race, sex, or socio-economic factors.

Given the mandate outlined above, the thrust of the EBCE design problem was to take the last two years of secondary education, along with the concepts of the World of Work, and develop an educational schema that would provide a systematic and coordinated experiential learning program for each student. To compound the magnitude of the problem, the design efforts had to obtain and coordinate programmatic inputs from diverse community groups, business and labor groups, educators at the state and local levels, and the Kanawha County School Board. A detailed description of the design procedures employed in the development of the AEL/EBCE program is not possible within the scope and intent of this paper. However the processes whereby the multiple design and development tasks were accomplished are completely described in the discussions that follow.

Design Strategies:

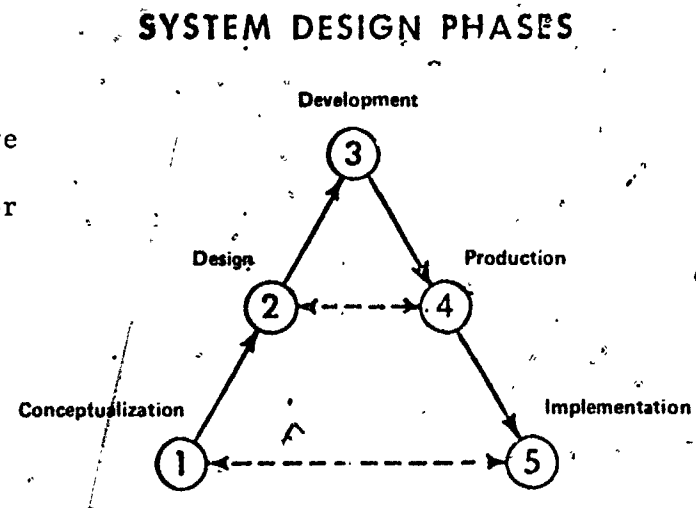


Figure 1

The basic design strategy used to develop the AEL/EBCE program involved a five phase, twelve step approach to curriculum design. The major advantage of the strategy employed by the EBCE Design Staff is that it enables the curriculum planners to: (1) develop a comprehensive initial plan of the program's overall characteristics and configuration; (2) organize the resources and multiple expert inputs required to achieve the desired program configuration; and (3) systematically identify and address the operational requirements and constraints of the planned program. The five design phases of Conceptualization, Design, Development, Production, and Implementation are all too often looked upon as a series of discrete tasks. However, when these tasks are undertaken sequentially, the likely outcome is a program that "looks good on paper" but falls flat in the realities of the operational setting. Figure 1 displays the relationships (of the five design phases) that were employed for the curriculum design of the AEL/EBCE program. While the phases were accomplished in a linear fashion, the requirements of the later phases (4 and 5) were addressed in the early phases (1 and 2) of the curriculum design effort. The following is a brief summary of the five design phases:

- Conceptualization: during this phase the basic program goals, objectives, and configuration of the program are defined. It is critical that the operational requirements and constraints be anticipated and addressed during this phase.

- Design: during this phase the basic conceptualization is expanded and the program documents, materials, resources, and procedures are identified and their general formats are outlined. The costs and the resources required to produce the planned system materials must be considered during the design phase to ensure that all materials can in fact be produced.

- Development: during this phase the system materials are written or procurred in accordance with the requirements established in both the Conceptualization and Design Phases. Student learning materials are to be tried out and validated on a representative sample

- Production: during this phase the necessary art work and media work are completed to produce the camera-ready copy of all system documents, materials, and manuals. All other resources, including the learning environment, are organized so as to support the operational requirements of the program.

- Implementation: during this phase all program materials are operationally organized and Staff Training is conducted to qualify the instructional staff on all phases of program operation.

The design phases described above provides the conceptual framework which defines what must be done in order to create an operationally sound program of learning.

Design Process:

A detailed display of the twelve design steps is provided in Appendix A of this paper. The intent here is to develop a general description of the design steps and to show the relationship of these steps to the five design phases described in the preceding section. The twelve design steps are listed accross the top of Figure 2. The systematic application of these steps produce:

SYSTEM DESIGN PROCESS

DESIGN STEPS / DESIGN PHASES	FEASIBILITY STUDY	CONTENT REQUIREMENTS	IDENTIFYING RESOURCES	OUTLINING ACTIVITIES	RELATING ACTIVITIES	OUTLINE LEARNING UNITS	LOCATE LEARNING STATIONS	LOCATE RESOURCE CENTERS	OUTLINE LEARNING PLANS	PROCURE RESOURCES	WRITE LEARNING PLANS	DEVELOP RECORD SYSTEM
CONCEPTUALIZATION	O	O	O	O								
DESIGN		O	O	O	O	O	O	O	O			
DEVELOPMENT				O	O	O	O	O	O	O	O	
PRODUCTION							O	O	O	O	O	O
IMPLEMENTATION							O	O	O	O	O	O

Figure 2

- A complete listing of program content.
- A complete listing of the instructional resources required to support student learning of the program content.
- A display of potential student learning activities.
- A listing of student-centered learning objectives.
- An organizational plan for the learning environment or educational facilities.
- A complete set of teacher-centered and student-centered instructional materials.
- An operationally sound management system for the documentation and coordination of student progress and performance.

The twelve design steps, in summary, produce all of the program materials required to: (1) establish WHAT the program will cover and WHAT instructional resources are required to support student learning; (2) define WHERE student learning will occur and the conditions underwhich it will occur; and (3) establish procedures as to HOW each student's program will be delivered and managed. (Nichols, Schill, and McCartin, pp.B24-29, 1971). The intent of Figure 2 is to show that in the Conceptualization Phase selected design steps are used to establish the initial definitions of WHAT the program will cover, WHERE the learning will occur, and HOW the program will be managed. In the Design Phase additional steps are employed to expand and refine the initial definitions into detailed descriptions of all program documents, materials, resources, and procedures. During the actual Development Phase the results of the first two phases are used to write and validate the required teacher-centered and student-centered materials. The Production Phase utilizes the steps that result in the final format and reproduction of all program materials. In the Implementation Phase steps are applied to operationally organized the program materials and to provide the training required to successfully install the program.

The system design process employed in the development of the AEL/EBCE program requires that the "What," the "Where," and the "How" of program operation be identified and systematically defined in each of the initial phases of the design process (i.e., Conceptualization, Design, and Development). The design process further requires that in each phase the overall program requirements be continually addressed and that the information produced in a given design phase is used as the data base for the efforts in the subsequent phase of design activity. The strategies encompassed by this design process provides the framework within which complex sets of program information and resources can be gathered, organized, and developed into a sys-

tematic and operationally sound program of learning. The section that follows describes the application of this design process to the development of the AEL/EBCE program.

EBCE Design Factors;

In April, 1974, a formal review of the AEL/EBCE program was conducted by a select committee established by the National Institute of Education. This select committee consisted of the following members:

Dr. Keith Goldhammer, Chairman
Dean, College of Education
Michigan State University

Dr. Glenys G. Unruh
Assistant Superintendent for
Curriculum and Instruction
University City School System
University City, Missouri

Dr. Richard A. Graham
Federal Executive Fellow
The Brookings Institutions

Mr. Claude Brown
Director of Research
and Education
Teamsters Local Union 688
St. Louis, Missouri

Mr. Charles R. Bowen
Program Director, Educational
Development Corporate Staff
International Business Machines
New York, New York

After a comprehensive and critical review of the AEL program the select committee's report, currently available from the National Institute of Education, listed the program's overall strengths and weaknesses. Their review of the Instructional System produced the following observation:

> The (AEL/EBCE) instructional system flows from a design which is virtually unlimited in its potential power for delivering instructional objectives. Although complex, its interrelationships are organized with a rationality that provides for ease in utilization. Working from a series of matrices, the designers have created a system that can continually generate new curricular and instructional concepts and objectives in response to changing knowledge and environment. The instructional system appears to have the quality of ready transportability to replication sites.
>
> The back drop for the instructional system includes five program areas; Natural Science, Mathmatics, Social Studies, Career Education, and Communication Skills (organized into 28 secondary level courses). Twenty-nine major concepts with 122 sub-concepts have been identified. From these stem 450 organizing objectives which have the capacity for yielding unlimited multitudes of instructional objectives. (Goldhammer, et al, p 7, 1974).

During the initial Conceptualization Phase of the AEL/EBCE program three basic program characteristics were identified. First, the EBCE program was to be an alternative, career oriented, educational experience for high school juniors and seniors. Second, the students were to spend the majority of their time out of the classroom and in the community at cooperating experience sites. Third, each student was to receive an individualized program of learning based on assessed academic/career interests and needs. (Weish, Ryan, pp. 1-10, 1972). Implicit in these three statements was the need for the program to develop materials and procedures for translating each student's EBCE experiences in such a way as to be acceptable for credit at the student's home high school; also, there was a clear need for procedures to organize and analyze community sites so as to document the learning opportunities that exist at each cooperating site; finally, a mode of student learning had to be identified that would ensure the delivery of an individualized set of program activities. Considering the implementation requirements of such a program it was determined that there would have to be: (1) a highly flexible curriculum structure for the academic component of the program; (2) a complete file of documents which would detail the learning opportunities at each cooperating experience site; (3) procedures that would rapidly identify and document each student's programmatic needs and interests; and (4) an administratively simple program management system that would allow the instructional staff to monitor each student's progress and performance in the program. The most critical part of the Conceptualization Phase was identifying the mode of student learning. It was obvious that teacher-centered or group-paced learning activities would be clearly inappropriate given the mandate for individualized instruction. The utilization of Programmed Texts and materials was ruled out because of the requirement to integrate academic learning with experiences out in the community.

Considering all of the planned program charateristics it was decided that an Independent Study Program based on an Inquiry/Quest approach to learning would be the most appropriate means of personalizing each student's EBCE program. A basic reference for the Inquiry/Quest approach taken in the AEL/EBCE program is found in the text, Education By Appointment, chapters 2 and 3. (Brown, 1968). The Inquiry/Quest approach was expanded and procedural-ized over the eighteen month period of program design and this approach now provides a systematic foundation for personalized, experientially-based learning. (see reference: Hyre, Inquiry: A Personalized Approach to Learning, 1974).

The final determination that was made in the Conceptualization Phase dealt with the role of the instructional staff. Given the goal of a personalized approach to learning, it was essential that a personal relationship be established between the teacher and each student. The role that was finally selected would call for the instructional staff to act as "managers" and "coordinators" of student learning rather than to serve as teachers who would disseminate specific facts and information for a given subject area. (Pfiffner, Nichols, 1973 and Shank, 1974). The instructional staff would, in effect, act as "Educational Brokers" who would work with each student to arrange and coordinate learning experiences to satisfy the student's established program goals. To operationally perform in the role of "Learning Coordinator" it was clear that specialized program documents would have to be designed for the instructional staff so as to facilitate the rapid identification and accessing of a wide range of learning activities, resources, and career experiences. With this definition of the role of the instructional staff, the overall conceptualization of the AEL/EBCE program was complete and the major operational (implementation) requirements had been identified.

Technical Design Discussion:

This discussion outlines the process whereby the series of design matrices were established for the AEL/EBCE program. Figure 3 displays the conceptual relationships between the multiple factors that were addressed through the matrix analysis techniques for curriculum design. A full sized copy of Figure 3 is provided on the last page of this paper. The reader should remove that copy and refer to it as necessary for clarification and for understanding of the technical discussions that follow.

EBCE DESIGN FACTORS AND RELATIONSHIPS

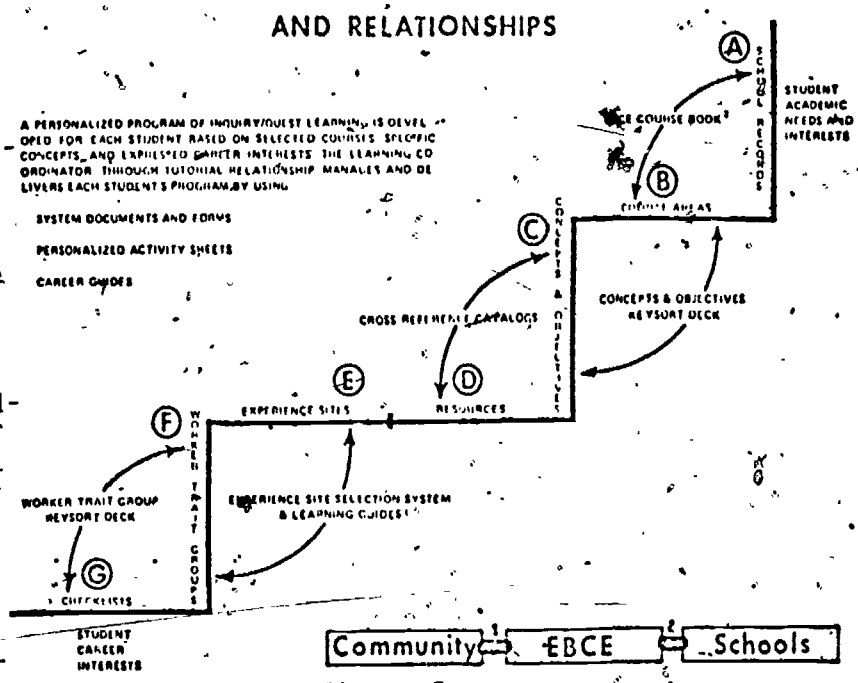


Figure 3

There were two primary concerns at the beginning of the Design Phase for the AEL/EBCE program. First, was the need to establish a hierarchy of Concepts and Objectives that would form a flexible curriculum base for the EBCE program; and then to relate this hierarchy to appropriate instructional resources that could be used by students. (see axes B, C, and D of Figure 3). Second, was the pressing need to organize and analyze a series of community sites that would provide a wide range of potential career and academic learning experiences: and then to relate these sites to a system that would enable a student to select sites based on expressed or measured interests. (see axes E, F, and G of Figure 3). The initial priorities for the Design and Development efforts were that of establishing the Concepts and Objectives Structure (axis C) and establishing a set of experience sites (axis E).

The process of designing the hierarchy of Concepts and Objectives required inputs from task forces of subject matter specialists (in the program areas of Natural Science, Mathmatics, Social Studies, Communication Skills, and

Career Education); and a review of basic curriculum resource materials (e.g., the National Assessment of Educational Progress series). After numerous task force conferences and reviews a final list of 291 major concepts, 122 sub-concepts, and 450 organizing objectives were identified and the subject matter specialists reached a consensus that the final structure would form an adequate curriculum base for the five program areas. This final listing became the entries for the Concepts and Objectives axis (see axis C of Figure 3). Once this axis was established, the task forces of specialists identified the Instructional Resources (axis D) that could be utilized to support student learning of the organizing objectives. The resulting matrix (i.e., the interrelationships between axes C and D of Figure 3) displayed in graphic form a complete listing of texts, film strips, audio cassettes, programmed materials, etc., that were appropriate for the learning of each set of objectives.

The process for establishing the total set of community experience sites (axis E of Figure 3) was somewhat more difficult than the process for designing the Concepts and Objectives axis. First, a strategy had to be established that would secure the initial participation and support of business, labor, local government, and professional groups for the EBCE concept. The resulting design efforts produced a set of procedures and techniques for contacting and presenting the EBCE program to the spectrum of community groups and for coordinating their participation in the program. (Kaufman, 1974). Next, a process had to be designed that would systematically define and document the career and academic learning opportunities that were available at each cooperating experience site. Our initial site analysis process utilized the "Functional Task Analysis" approach to job analysis. (Fine, 1971). This approach was expanded and refined to produce a process for identifying and documenting the Job Titles, Job Functions; Job Responsibilities, and the

range of special academic learning opportunities that were available at each cooperating experience site. (Pfiffner, 1974). With the establishment of these procedures 120 different community sites were analyzed and the results of this analysis formed the entries for axis E of Figure 3. At this point, the next design problem was that of relating the opportunities which ex[illegible] at the experience sites to the career interests of the individual stu[illegible]. The initial technique used by AEL to relate student career interests to experi[illegible]s was based on the 15 Career Clusters developed by the U.S. Office of Education. (USOE, 1972). The 15 Career Clusters, however, proved to be much too gross of an organizing system to provide any real job selection by students. This technique was abandoned in favor of a more effective and prove[illegible] technique for relating individual interests to careers. AEL's Career Decision-making Program had developed materials for relating an individual's career interests to the 114 Worker T[illegible] Groups (found in the Dictionary of Occupational Titles). Through a series of simple checklists, a modified version of the General Aptitude Battery (GATB), and the Ohio Vocational Interest Survey (OVIS) an individual could identify which of the 114 Worker Trait Groups are most compatible with his or her interests, aptitudes, and abilities. The direct incorporation of this system formed the entries for axes F and G of Figure 3. By inspecting the job titles found at each experience site, and by using the AEL Manual, "Guide for Exploring Careers Through Worker Trait Groups" (Winefordner, 1972), each job title could be categorized under a specific Worker Trait Group. By adopting the Worker Trait Group structure the matrix network was established whereby a student's career interests could be assessed (axis G) and related to a specific Worker Trait Group (axis F) and then related to a specific set of job titles at cooperating experience sites (axis E of Figure 3). This network provided the needed information for placing the students at experience sites which are related to their career interests.

The last remaining design problem was that of translating EBCE learning experiences into a formal course credit structure. This was accomplished by re-establishing the task forces of subject matter specialists and Community Advisory Council members to identify specific course areas that could be legitimately covered by the previously established hierarchy of Concepts and Objectives. The efforts of these task forces produced a list of 28 discrete courses of study that could be pursued within the EBCE program. This list of 28 courses became the entries for the Course Area axis (axis B of Figure 3). Formal procedures were then established for reviewing a student's high school record and transcripts (axis A) and for selecting the appropriate EBCE courses that would provide the credits required by the student for graduation.

With the accomplishment of the step described in the paragraph above, the total matrix network was in place to provide complete information that related:

- Student academic requirements -to- specific EBCE courses.
- Specific EBCE courses -to- appropriate Concepts and Objectives.
- Concepts and Objectives -to- related Instructional Resources.

and

- Assessed Career Interests -to- related Worker Trait Groups.
- Worker Trait Groups -to- specific jobs at experience sites.

The results of the Conceptualization Phase and the Design Phase produced the complete data base for the development of the procedures, manuals, and documents required by the Learning Coordinators to effectively deliver a personalized program of community based Inquiry/Quest learning activities to each student. The following is a descriptive list of the basic AEL/EBCE materials that were ultimately developed, produced, and implemented:

- EBCE COURSE LIST: the document that lists and describes each course offered in the EBCE program. Used by the L.C. and the student.

- COURSE KEYSORT CARDS: the keysort system used by the student and the L.C. to select, by courses, the Concepts and Objectives that the student will study while in the EBCE program

- CONCEPTS AND OBJECTIVES MANUAL: the complete listing of the curriculum structure of the five major EBCE program areas.

- PROGRAM DESCRIPTOR: that portion of the student's program profile that lists the specific objectives which make up the student's EBCE program.

- CROSS REFERENCE CATALOGS: the set of documents which relates appropriate instructional resources, suggested student activities, and experience site opportunities to each of the 450 organizing objectives. These catalogs are used by the L.C. and the student to develop Activity Sheets for each course objective selected by by the student.

- EXPERIENCE SITE LEARNING GUIDES: the document developed for each cooperating site. The guide provides a general description of the site and the types of jobs and experiences that can be explored at the site. Used by the student and the L.C. for site selection.

- ACTIVITY SHEETS: a single page Learning Activity Package, written by the L.C. and the student, that explicitly describes the Inquiry/Quest activities the student will follow to satisfy a specific learning objective (or set of objectives).

- WORKER TRAIT GROUP KEYSORT CARDS: the keysort system used by the student to relate his or her career interests to specific Worker Trait Groups. This activity provides the information for placing the student at a site that is related to the measured interests.

- CAREER GUIDES: the document used by the student while at an experience site to gather information about the job and to use that information for career decision-making purposes.

- BASIC PROCEDURES MANUAL: the centralized listing of the step-by-step procedures for using the AEL/EBCE program materials.

The materials listed above are the major curricular tools needed to operate the AEL/EBCE program. An assortment of additional materials are also available and are considered to be vital the the program in the aggregate.

Summary:

Throughout the preceding discussion of the matrix analysis process the establishment of each axis was described as a separate and discrete design event. In actual practice, however, many of the axes were developed concurrently.

As the program design effort progressed to its final stages of refinement, it was determined that many of the initial design decisions were un-workable in practice (e.g., the use of the 15 USOE Career Clusters to relate student interests to specific careers). When this was the case, the specific axis was revised and refined so as to provide the necessary information to meet the operational requirements of the emerging program. The critical point, however, was that the relationship of a given axis to its connecting axis did not change nor did the original conceptualization of the purpose of the axis. What this means to the curriculum designer is that the entries on a given axis can be expanded, contracted, or generally modified as long as the revised entries reflect an improved method of organizing and displaying the information on the axis; and as long as the revised entries establish a more valid relationship to the connecting axis. This capacity for rapid and flexible revision of specific axis content and information is the primary advantage of the Matrix Analysis approach to curriculum design.

REFERENCES AND SELECTED BIBLIOGRAPHY

Brown, B. Frank. Education By Appointment: New Approaches to Independent Study. West Nyak: The Parker Publishing Company, 1968.

Dewey, John. Experience and Education. New York: The Mac Millan Company, 1938.

Fine, Sidney and Willey, A.W. An Introduction to Functional Job Analysis. The W.E. Upjohn Institute for Employment Research, Sep. 1971.

Goldhammer, Keith, et al. The External Site Review Team Report on the AEL/EBCE Program. Washington, D.C.: The National Institute of Education, 1974.

Hill W.F. Learning, A Survey of Psychological Interpretations. San Francisco: Chandler Publishing Company, 1963.

Hyre, C. Steve. Inquiry: A Personalized Approach to Learning. Charleston, W.Va.: The Appalachia Educational Lab., 1974.

Illich, Ivan. Deschooling Society. New York: Random House, 1970.

Kaufman, R.J. Involving Labor Unions in Career Education. Charleston, W.Va.: The Appalachia Educational Lab., 1974.

Marland, S.P. "Career Education: Every Student Headed for A Goal." American Vocational Journal. March, 1972

Marland, S.P. Career Education: A Proposal For Reform. New York: McGraw-Hill Publishers, 1975

Nichols, H.E., Schill, W.J., and McCartin, R. Individualizing Learning: A Resource Book. Seattle: The University of Washington, Department of Higher Education, 1971.

Pfiffner, Karen and Nichols, H.E. The Role of the Learning Coordinator: An Operational Paper. Charleston, W.Va.: The Appalachia Educational Lab., 1973.

Pfiffner, Karen. Analyzing the Community for Learning. Charleston, W.Va.: The Appalachia Educational Lab., 1974.

Schill, W.J. and Nichols, H.E. Career Choice and Career Preparation. Danville, Ill.: The Interstate Press, 1970.

Schwab, J.S. "The Concept of the Structure of A Discipline" Educational Record. July, 1962.

Shank, Gary. The Learning Coordinator: A New Deal For Students. Charleston, W.Va.: The Appalachia Educational Lab., 1974.

U.S. Office of Education. Career Education: A Handbook for Implementation. Washington, D.C.: The Government Printing Office, 1972.

Welsh, P. and Ryan, T., et al. The FY 1973 Operational Plan for EBCE. Charleston, W.Va.: The Appalachia Educational Lab., 1972.

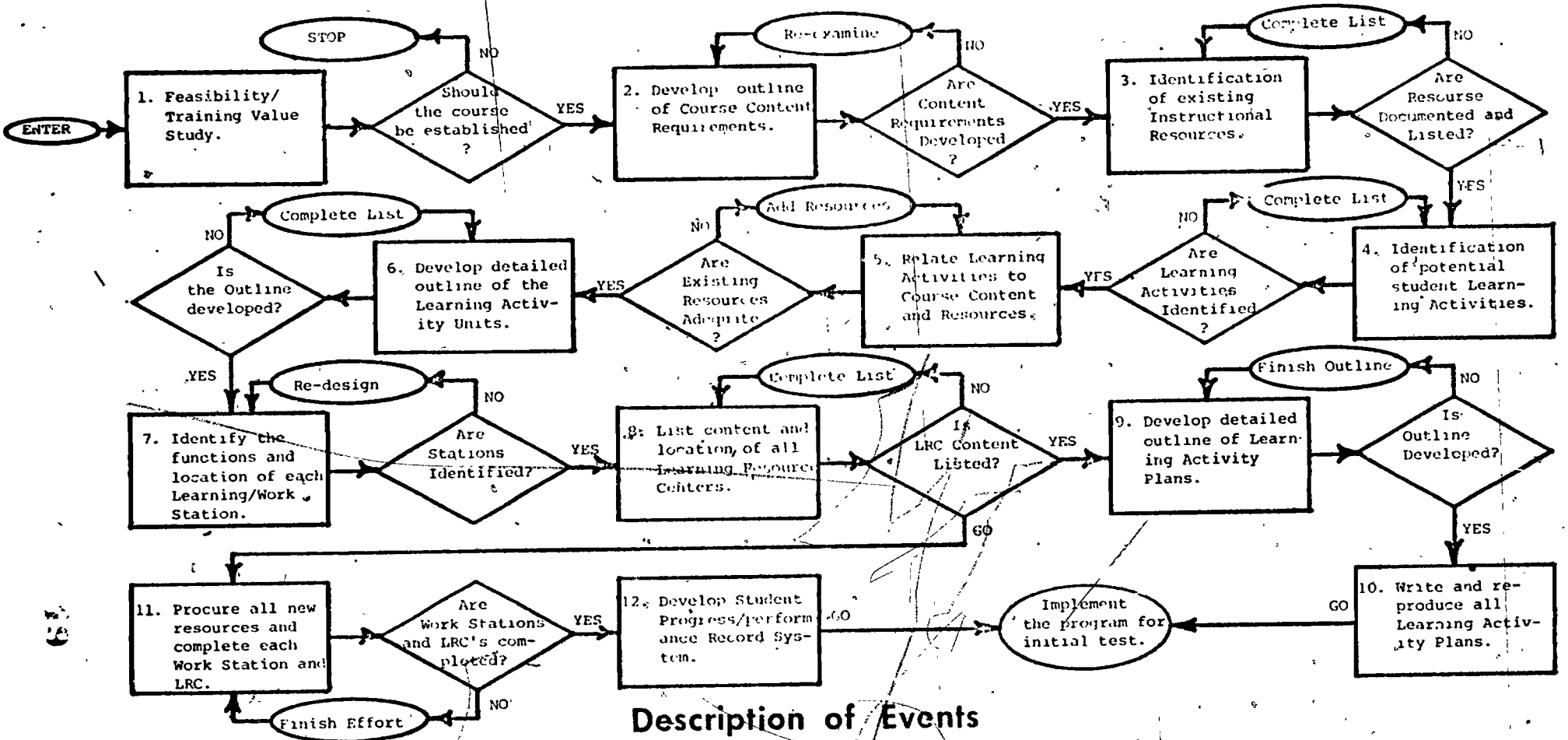
Winefordner, David, et al. Guide for Exploring Careers Through Worker Trait Groups. Charleston, W.Va.: The Appalachia Educational Lab., 1972.

APPENDIX A

System Development Flow[1]

[1] Nichols, H.E., Schill, W.J., and McCartin, R. Individualizing Learning: A Resource Book. Seattle: The University of Washington, Department of Higher Education, 1971.

SYSTEM DEVELOPMENT FLOW



Description of Events

1. FEASIBILITY STUDY: review of overall goals and objectives to ascertain if a comprehensive Learning System is needed. Factors such as the number of students, frequency of offering, length of the program, etc., are used in making the decision.

2. COURSE CONTENT REQUIREMENTS: identify the subject matter to be covered by the program to form a complete listing of what the student will be able to DO and KNOW as a result of completing the overall program.

3. IDENTIFYING RESOURCES: a complete review of the instructional materials that are available to support the learning of the course content. This involves specifying texts, films, audio tapes, audio-visual equipment, shop equipment, etc., that can be made available to students.

4. OUTLINING ACTIVITIES: establishes the relationship between the Course Content and the Instructional Resources. This shows how each Instructional Resource can be used to support the learning of the skills and concepts outlined in the Course Content List.

5. RELATING LEARNING ACTIVITIES: enables the planner to determine whether or not the existing instructional resources provide adequate coverage of the subject matter. When existing resources are inadequate, additional instructional resources are identified to assure complete coverage.

6. OUTLINE OF LEARNING UNITS: requires that the Course Content topics be grouped into related units of learning activities. This is the organization of the course content into major units, or blocks of instruction.

7. LOCATION OF LEARNING STATIONS: requires a detailed analysis of the classroom and/or shop areas to determine how these areas can best be organized to facilitate student learning activities.

8. LOCATION OF RESOURCE CENTERS: requires that the instructional resources needed to support the students' activities be placed in Resource Centers that are in close proximity to the various Learning Stations.

9. OUTLINE OF LEARNING ACTIVITY PLANS: involves analyzing each major unit of instruction to identify: (1) the number of LAP's that need to be developed for each unit; (2) the objectives of each LAP; and (3) the instructional resources to be used in each LAP.

10. WRITING LEARNING ACTIVITY PLANS: utilizes the results of the nine preceding steps. At this point there is complete information concerning: (1) the Course Content; (2) the Instructional Resources; (3) the classroom/shop layout; (4) the Major Course Units; and (5) and the content of the LAP's.

11. PROCURING ADDITIONAL RESOURCES: this is to be accomplished concurrently with steps nine and ten. The learning environments and resources should be in place prior to the completion of the LAP's.

12. DEVELOP PROGRESS/PERFORMANCE RECORD SYSTEM: this effort follows the final listing of all LAP's. The Student Progress/Performance Record System must be administratively simple and it must graphically show the relationship between the student and program completion.

NOTE: The "EBCE Design Factors and Relationships" diagram shown on the next page is to be removed and used as a reference while reading the Technical Discussion Section of this paper (pages 8 through 11).

EBCE DESIGN FACTORS AND RELATIONSHIPS

A PERSONALIZED PROGRAM OF INQUIRY/QUEST LEARNING IS DEVELOPED FOR EACH STUDENT BASED ON SELECTED COURSES, SPECIFIC CONCEPTS, AND EXPRESSED CAREER INTERESTS. THE LEARNING COORDINATOR, THROUGH TUTORIAL RELATIONSHIP, MANAGES AND DELIVERS EACH STUDENT'S PROGRAM BY USING:

- SYSTEM DOCUMENTS AND FORMS
- PERSONALIZED ACTIVITY SHEETS
- CAREER GUIDES