To the Graduate Council:

I am submitting herewith a dissertation written by Benjamin Ardell Hirst, Jr., entitled "An Application of the Delphi Technique to Develop an Activity Model for the Vocational-Technical Education Consortium of States." I recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Education, with a major in Vocational-Technical Education.

George Wiegers, Jr., Major Professor

We have read this dissertation
and recommend its acceptance:

Accepted for the Council:

Vice Chancellor
Graduate Studies and Research

AN APPLICATION OF THE DELPHI TECHNIQUE TO DEVELOP AN ACTIVITY MODEL FOR THE VOCATIONAL-TECHNICAL EDUCATION CONSORTIUM OF STATES

A Dissertation

Presented for the

Doctor of Education

Degree

The University of Tennessee

Benjamin Ardell Hirst, Jr.

August 1974

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ABSTRACT

Purpose. The purpose of the study was to develop an activity model for the Vocational-Technical Education Consortium of States (V-TECS). Studied as a part of the problem were trends in the related literature, selected operating projects across the United States, and results obtained by the use of three Delphi probes from a jury of selected experts. Information was collected from the jury concerning the relative importance of an a priori listing of activities and sub-activities under realistic "IS" and idealistic "SHOULD BE" constraints. In addition, the jury responded to the chronological arrangement and sequencing of activities.

Methods. The methods used to conduct the study were: (1) development of an a priori activity model based upon the review of related literature and a study of selected projects; (2) development of an a priori master sequence chart; (3) selection of a Jury of Experts; (4) development of a Delphi instrument; (5) administration of three Delphi probes; (6) development of criteria for inclusion and exclusion of activities and sub-activities; and (7) analysis of the information collected by use of SPSS programs at The University of Tennessee Computing Center, Knoxville, Tennessee.

Finding. The finding of the study was the activity model for V-TECS which consists of 12 major activities and 47 sub-activities. The activity model provides a means of developing catalogs of performance

objectives and criterion-referenced measures in occupational education on a uniform basis among the cooperating states. In addition, a master sequence chart with PERT characteristics was developed by the Jury of Experts as a guide to the systematic development of V-TECS projects.

Recommendations. The study contains six recommendations:

1. The Vocational-Technical Education Consortium of States should adopt and implement the activity model developed as a result of the study.

2. V-TECS should develop a PERT program or other project control procedure to identify the average time required to develop the products of the consortium by each activity. In addition, costs of implementing each activity should be carefully recorded and made a working part of the project control procedure. Time and cost information would enhance the management of V-TECS and the economic effectiveness of the consortium.

3. V-TECS should instigate further research of the sub-activities in the activity model which have the widest variance between the realistic and idealistic ratings (IS and SHOULD BE). This variance could be an indication of the sub-activities which may be the most difficult to implement from the point of view of the Jury of Experts.

4. It is recommended that existing agencies and institutions adopt and refine the methodology used in this study for the development of models for other critical endeavors.

5. New consortium efforts should consider using the methodology in this investigation to clarify goals, specify activities and sub-activities, and improve the cost-effectiveness of the consortium effort.

6. Existing consoria which are anticipating a redirection of goals should consider adopting components of the model which fit their needs and purposes.

TABLE OF CONTENTS

CHAPTER		PAGE
I.	THE PROBLEM OF THE STUDY	1
	Introduction	1
	The Problem	5
	Assumptions	7
	Objectives of the Study	8
	Scope of the Problem	8
	Definition of Terms	10
	Importance of the Study	16
	Nature and Sources of Data	19
	Organization of the Study	21
II.	REVIEW OF RELATED LITERATURE	23
	Introduction	23
	Accountability in Education	24
	Performance Objectives and Criterion-Referenced Measures	32
	Educational Consortia	37
	Model Development in Education	45
	Specific Projects and Models Studied for the Development of the Phase I a Priori Activity Model for the Vocational-Technical Education Consortium of States	50
	The Delphi Technique	86

CHAPTER PAGE

III. METHODOLOGY 95

Phase I of the Study 98

Phase II of the Study 108

IV. THE PHASE I A PRIORI ACTIVITY MODEL FOR THE VOCATIONAL-TECHNICAL EDUCATION CONSORTIUM OF STATES 114

Introduction 114

The Phase I Activity Model 114

V. PRESENTATION AND DISCUSSION OF DATA 146

Summary of Responses from the Jury of Experts 146

Analysis of the Instrumentation 148

Analysis of Data from Delphi Probe I 150

Analysis of Data from Delphi Probe II 159

Analysis of Data from Delphi Probe III 169

Convergence of Opinion as a Result of Delphi Probes I, II, and III 178

VI. SUMMARY, FINDINGS, AND RECOMMENDATIONS 189

Summary of Procedures 189

Findings of the Study 190

Conclusions 222

Recommendations 223

BIBLIOGRAPHY 225

APPENDICES 239

Appendix A 240

Appendix B 244

Appendix C 246

CHAPTER PAGE

Appendix D 248

Appendix E 256

Appendix F 265

Appendix G 270

Appendix H 274

Appendix I 312

Appendix J 356

VITA 439

LIST OF TABLES

TABLE PAGE

1. Summary of Responses of the Jury of Experts to Delphi Probes I, II, III 147
2. Alpha Coefficients of Reliability--Delphi Probe I 149
3. Mode, Number of Respondents Representing the Mode, Mean, Standard Deviation, Percent of Responses Above 3.0 by "IS" and "SHOULD BE" and by Sub-Activity for Delphi Probe I (N=36) 152
4. Sequencing Responses Made by the Jury of Experts, Delphi Probe I, by Number of Respondents, Percentage of Respondents by Category and by Activity (N=36) 155
5. Sequencing Changes and Additions Recommended by Jury of Experts on Delphi Probe I Used for Developing Delphi Probe II 156
6. Modes, Means, and Standard Deviations for Delphi Probe I (N=36) 158
7. Mode, Number Marking the Modal Response, Mean, Standard Deviation, and Percent Rating the Sub-Activity at the Scale Value of 4.0 or Above by "IS" and "SHOULD BE" (N=36) 163
8. Sequencing Responses Made by the Jury of Experts, Delphi Probe II, by Number of Respondents, Percentage of Respondents by Category and by Activity (N=36) 164

TABLE PAGE

9. Mode, Number of Respondents Representing the Mode, Mean, Standard Deviation, Percent of Responses Above 4.0 by "IS" and "SHOULD BE" and by Sub-Activity for Delphi Probe II (N=36) 166

10. Modes, Means, and Standard Deviations for Delphi Probe II . 171

11. Mode, Number of Respondents Representing the Mode, Mean, Standard Deviation, Percent of Responses Above 4.0 by "IS" and "SHOULD BE" and by Sub-Activity for Delphi Probe III (N=36) 173

12. Modes, Means, and Standard Deviations for Delphi Probe III (N=35) 177

13. Means and Variances for Delphi Probes I, II, and III by Activity and by "IS" and "SHOULD BE" Within Each Activity 179

14. Alpha Coefficients and Variances by Activity for Delphi Probes I, II, and III 185

LIST OF FIGURES

FIGURE		PAGE
1.	U. S. Air Force Instructional Systems Development Model . .	73
2.	Chronological Sequence of the Major Tasks of the Study . . .	97
3.	Master Sequence Chart for the Phase I a Priori Activity Model	145
4.	Profile of Mean Responses of the Jury of Experts by "IS" and "SHOULD BE"	160
5.	Profile of Mode Responses of the Jury of Experts by "IS" and "SHOULD BE"	161
6.	Profile of Mean Response of the Jury of Experts on Delphi Probe II by Activity and by "IS" and "SHOULD BE"	170
7.	Profile of Mean Responses of the Jury of Experts on Delphi Probe III by Activity and by "IS" and "SHOULD BE"	176
8.	Jury of Experts Response Variance for Delphi I and III by Activity	182
9.	Jury of Experts Response Variance for Delphi Probe I and III by Activity and by "IS" and "SHOULD BE" Within Each Activity	184
10.	A Profile of Variance and Alpha Internal Consistency Coefficients for Delphi Probes I, II, and III	186
11.	A Graphic Illustration of the Range of Variance, Items Variance, Scale Variance, Formula and Calculations for the Alpha Coefficient for Delphi Probes I, II, and III . .	188

FIGURE PAGE

12. Master Sequence Chart for the Phase II Activity Model . . . 221

13. Master Sequence Chart for the Phase I a Priori Model, Delphi I 311

14. Master Sequence Chart for the Phase I a Priori Model, Delphi II 355

15. Master Sequence Chart for the Phase II Activity Model, Delphi III 399

CHAPTER I

THE PROBLEM OF THE STUDY

I. INTRODUCTION

In the decade of the 1970's, education faces many complex problems and issues. Among these issues and problems are needs for the following: (1) improving accountability, (2) demonstrating adequate ways for making programs more cost effective, (3) incorporating a systems approach for the development of instructional materials, and (4) ensuring the relevance of what is taught in the various vocational-technical programs. In addition to these problems, questions continue to arise regarding the revenue base for education. Taxpayers are becoming increasingly concerned about the return on the tax dollar for education and are asking for answers to the following questions concerning educational accountability:

1. How is education in this country financed?
2. Is there a more equitable system for financing the educational system?
3. Who should pay for the schools?
4. What is the local, state, and federal responsibility for education?
5. Should there be an increased concern focused on program outcomes in terms of learner performance?

These questions appear to be logical ones which, in all likelihood, must be answered before education will make significant improvement in the eyes of the public. The idea of cooperation is one possibility for moving toward increased educational accountability. This concept has been overlooked, on a large scale, by educators.

Franklin Patterson[1] in his book, Colleges in Consort, pointed out:

> . . . the consortium movement is not adequately meeting needs. . . . despite all the constructive achievements of consortia and the valiant efforts of the majority of consortia directors to do a great deal with too little of everything, the consortium movement fails as yet to meet the critical need that exists for effective interinstitutional cooperation. Consortia generally have so far not succeeded in achieving planned academic complementary capital outlay planning among their institutions; they have only just begun to rationalize business and administrative operations on a joint basis; and they have not been a major source of innovation in the delivery of services to existing or possible new clienteles. Some consortia stand out in trying to meet with need for cooperation; most make an effort within serious limits, and some seem like paper organizations. None come up to the need adequately.

Cooperation in research, curriculum development, in-service training, and other educational endeavors may result in a saving of taxpayer dollars by eliminating duplication, encouraging sharing of expensive materials and equipment, and assuring that focus is brought to bear on the real problems of education.

These phenomena stimulated an interest in a project within the Southern Association of Colleges and Schools' Commission on Occupational Education Institutions (COEI). The project began with a study of the feasibility of forming a multi-state consortium for the purpose of

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[1]Franklin Patterson, Colleges in Consort (San Francisco: Jossey-Bass Publishers, 1974), p. 119.

developing comprehensive catelogs of performance objectives and criterion test items for selected areas in occupational education. The initial funding for the project was provided by the State of Florida through the Educational Research and Development Program. The State of Florida had accomplished some work in the area of performance-based instruction and realized that this approach to education and training was an improvement over the traditional method but that large sums of money were required to develop, design, and implement the materials. It occurred to certain educational leaders in Florida and to the staff of COEI that within this concept of a multi-state consortium there was embodied an excellent opportunity for extensive cooperation. It was realized that solid research, a unified system of development, and a comprehensive method of sharing materials and equipment might result from the formation of a multi-state consortium which would produce catalogs of performance objectives and criterion-referenced measures.

Four projects in Florida, all of which developed catalogs of performance objectives and criterion-referenced measures in occupational education, were studied. A report of Florida's approach was developed and published by the Southern Association of Colleges and Schools' Commission on Occupational Education Institutions. In addition to that report, A Status Report on Occupational Education, Accountability, Performance Objectives, Criterion-Referenced Measures, and Educational Consortia[2] was developed. Preparation of the report aroused interest

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[2]Southern Association of Colleges and Schools, Commission on Occupational Education Institutions, A Status Report on Occupational Education, Accountability, Performance Objectives, Criterion-Referenced Measures, and Educational Consortia (Atlanta: Southern Association of Colleges and Schools, April 3-5, 1973).

in conducting further investigations of the subjects.

The Southern Association of Colleges and Schools' COEI encouraged states to form a consortium through visits to the various State Departments of Education and through organizing and conducting a conference for interested states.[3] Following the on-site visits to the states and through subsequent action of a group of conferees, the Vocational-Technical Education Consortium of States (V-TECS) was formed in July, 1973.[4]

The researcher completed the requirements of the initial contract with the Southern Association of Colleges and Schools' COEI and was selected as Executive Director of the Vocational-Technical Education Consortium of States. In the initial stages of the consortium, Felix Robb, Director of the Southern Association of Colleges and Schools, Bob Childers, Executive Secretary of COEI, and members of the Board of Directors of V-TECS identified a need for a broad-based activity model to be used by V-TECS to manage the development, production, dissemination, and revision of the catalogs of performance objectives and criterion-referenced measures. The catalogs would be the primary product of the cooperative effort of the states. The idea of research to

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[3]The Educational Consortium: An Effort Toward Accountability? A Conference for Interested States (Atlanta: Southern Association of Colleges and Schools, Commission on Occupational Education Institutions, and the Florida Research and Development Program, April 3-5, 1973).

[4]Final Report of a Project for the Development of a Multi-State Consortium for the Production of Performance Objectives and Criterion Measures in Occupational Education (Atlanta: Southern Association of Colleges and Schools, Commission on Occupational Education Institutions, July, 1973), p. 37.

develop the activity model was presented to the Doctoral committee for consideration and approval. Letters of endorsement from Felix Robb and Bob E. Childers were addressed to the Chairman of the Committee at The University of Tennessee and are included as Appendix A of this report.

The Southern Association of Colleges and Schools' COEI supported the development of V-TECS for two basic purposes as follows:

1. To improve the quality of vocational-technical education in states participating in the consortium effort as well as in states not participating in the effort.
2. To provide for a higher degree of accountability through the use of catelogs of performance objectives and criterion-referenced measures which address themselves to outcomes of programs in terms of the expected learner performance.

These purposes formed the basis for the development of the activity model to be considered for use by V-TECS.

II. THE PROBLEM

Statement of the Problem

A need existed for an activity model to be used by V-TECS to manage the development, validation, production, dissemination, implementation, and revision of catalogs of performance objectives and criterion-referenced measures in occupational education. The purpose of the study was to develop and validate an activity model for consideration of the Board of Directors of V-TECS as a basis for operations.

Analysis of the Problem

Several facets of the problem were examined to reach a solution to the problem and to develop an activity model for use by V-TECS. The following facets, presented in question form, were studied during the development of the activity model:

1. What models or projects exist which are available for study and are being used to produce performance objectives and criterion-referenced measures in occupational education?

2. Of the models and projects reviewed during the study, which ones involve multi-agency cooperation?

3. Of the models and projects reviewed during the study, which ones involve autonomous agencies and institutions?

4. Which models and projects studied have agency and institutional representation cutting across state lines?

5. Which elements of the models and projects reviewed provide for quality control, validation, and revision of the products being developed?

6. What trends found in the literature can logically be considered for inclusion during the development of the activity model for V-TECS?

7. How can the public demand for increased educational accountability be incorporated into the model activities?

8. What basis exists in the literature on model development theory which will support and assist in developing the activity model?

9. What advantages can be realized through the use of Delphi Technique or a modified version of the Delphi Technique to validate the activity model?

III. ASSUMPTIONS

A number of assumptions were made during the design phase of the study which were necessary in order to select the jury of experts and to develop the survey instrument. The following assumptions were made for the study:

1. A model can be developed which will facilitate the development, production, dissemination, and implementation of catalogs of performance objectives and criterion-referenced measures in occupational education.

2. A review of the literature will contribute to the structuring of activities for the model and will provide logical support for the activities.

3. A study of existing models which relate to the goals of V-TECS will contribute both activities and logic to the model as it is developed.

4. A jury of experts will provide additional activities for inclusion in the model as it is developed and will provide convergence of opinion regarding the importance of the activities and the logical sequencing of the activities.

5. The Delphi Technique will provide a method of interaction between jurors which will enhance individual input.

6. The instrument is appropriate for securing information from the jurors concerning the development of new activities, the sequencing of activities, and the establishment of the relative importance of each activity.

7. The model will be considered for adoption by the Board of Directors of V-TECS.

IV. OBJECTIVES OF THE STUDY

The objectives of the study were as follows:

1. To develop an a priori activity model for V-TECS.

2. To obtain by use of the Delphi Technique additional activities and sub-activities for inclusion in the activity model for V-TECS.

3. To determine the relative importance of the activities and sub-activities.

4. To sequence the major activities of the model.

5. To recommend an activity model for V-TECS.

6. To identify areas of additional research in the procedures used and the activities and sub-activities included in the recommended activity model for V-TECS.

V. SCOPE OF THE PROBLEM

Delimitations

The study had the following two delimitations:

1. The study in no way attempted to identify sub-systems within the model sub-activities but focused primarily on major activities and sub-activities and their sequential relationship to each other.

2. The second delimitation was that only models which were available for study and were related to the use of performance objectives, the development of performance objectives, or computer storage of performance objectives were used in the study.

Limitations

The study had several limitations. Efforts were made to keep bias of the jury of experts and those of the researcher to a minimum. The specific methods used to control feedback and interpretation bias are elaborated in the methodology section of the report.

1. The major limitation of the study was the lack of a central source of information concerning activities and experiences within the United States regarding performance-based objectives and criterion-referenced measures. The source of most of the information on the successful usage of performance-based instruction was obtained from persons who were identified as pacesetters in the movement toward performance-based instruction.

2. The amount of time available for conducting certain phases of the study was limited. This may have resulted in overlooking significant activities or projects in the United States which were involved in performance-based instruction.

3. Funds available for research purposes were limited. No funds were budgeted from sources other than those of the researcher to carry out the study although certain central services such as printing, mailing, and clerical assistance were provided by the Southern Association of Colleges and Schools.

4. The inherent weaknesses of the Delphi Technique as a research and forecasting tool were considered a limitation. A presentation of the weaknesses of the Delphi Technique is included in Chapter II.

5. The selection of jurors willing to participate in the study was a limitation. Identification of the experts in each area of

expertise was a constraining activity of the project. The jury of experts may have been improved if a source of specialists in performance-based instruction had been available.

6. There was a lack of a body of information concerning the adoption and use of performance-based instruction in public education.

7. The jury of experts was selected by means of criteria presented in Chapter III, Methodology, and was considered to be a convenience sample rather than a randomly selected jury. Because of this limitation, no generalizations concerning the responses or the data will be made beyond the persons participating in the study.

8. The validity and reliability of the instrument was a function of the entries, recommended changes in sequencing, and other improvements made by the jurors during the three Delphi probes. A presentation of reliability is included in Chapter V.

VI. DEFINITION OF TERMS

The following definitions were utilized for purposes of the study:

Activity. A series of interdependent sub-activities or steps established for the purpose of attaining a particular goal or end.

Activity sequencing. The sequencing of activities based upon the first occurrence of any of its sub-activities during the longitudinal development of a product or process.

Activity model. A combination structural and functional model consisting of a sampling of possible activities and sub-activities from the universe of the problem area.

A priori activity model. A model developed by deductive logic from the literature reviewed for the study and the analysis of profits and/or models which were or had been in operation.

Catalog. A comprehensive collection of performance objectives and criterion-referenced measures organized by a job structure or career ladder within a domain of interest.

Criterion-referenced test item. An exercise based upon a performance objective and designed to allow the determination of whether or not the learner has accomplished the objective. It possesses each of the characteristics specified below:[5]

a. Congruence--The task specified in the item corresponds directly to the performance specified in the objective, including the situation, action, object, and limits.

b. Comprehensibility--The item-specified task is so stated or portrayed that the learner clearly understands what is expected of him.

c. Objectivity--The exercise (including component items, if any) is stated in such a way that all competent observers can make a clear and unequivocal decision as to whether or not the learner has demonstrated an acceptable performance.

d. Integrity--The exercise is structured in such a way that an acceptable response to the exercise constitutes sufficient evidence, in and of itself, that the learner has accomplished the corresponding objective.

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[5]Technical Specifications for Catalogs of Objectives and Assessment Items (Tallahassee, Fla.: Florida Educational Research and Development Program, 1971), p. 7.

e. Equivalence--If two or more exercises correspond to a single objective, each exercise in the set is a true alternative in that a student who passes (or fails) one exercise on a given occasion would be expected to pass (or fail) any other exercise in the set.

Domain chart. A chart listing the major task areas within a domain of interest. An example of this is Automotive Mechanics as a domain of interest with a domain chart coding the performance objectives and criterion-referenced measures in units such as front-end alignment, brake overhaul, transmission, etc.

Domain of interest. The total content covered by a subject or occupation. Domain charts, as they become a part of a task analysis, provide the limits within which the performance objectives and the criterion-referenced test exercises are developed.

Educational accountability. Accountability is responsibility for something to someone with consequences for the discharge of the responsibility sure to follow.[6] For purposes of this study, Webster's definition of education and then accountability will be used to further support Lessinger's definition. According to Webster, education is "a science dealing with the principles and practices of teaching and learning." Webster defines accountable as "liable to be called to account; answerable, capable of being accounted for; explicable."

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[6]Leon M. Lessinger, From a speech delivered at a conference entitled The Educational Consortium: An Effort Toward Accountability, sponsored by the Southern Association of Colleges and Schools and the Florida Department of Education, Atlanta, Georgia, April 5, 1973.

Educational consortium. A group of state agencies, institutions, or other entities which have been legally constituted through letters of commitment, agreements, or by assignment of higher authorities to work together toward the solution of problems in education. A consortium, for the purposes of the study, must have membership from autonomous agencies and institutions which cut across state boundaries as they attempt to solve problems or meet goals.

Educational model. A pictorial or symbolic representation for the flow of activities and events required to accomplish predetermined goals or objectives and designed to indicate chronologically their impact on the educational establishment.[7]

Occupational education. An organized sequence of learning experiences consisting of vocational theory, practice, and skill for students on a regular or systematic basis.[8] For purposes of this study, the term "Occupational education" will be interchangeable with the term "vocational-technical education."

Performance objective. A statement in precise, measurable terms of a particular behavior to be exhibited by the learner under specified conditions. It possesses each of the elements or characteristics specified below:[9]

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[7] Ivan E. Valentine, Administration of Occupational Education: A Suggested Guide (Washington: U. S. Department of Health, Education, and Welfare, U. S. Office of Education, Contract No. OEC-0-70-4424), n.d.

[8] Standards of the Delegate Assembly (Atlanta: Southern Association of Colleges and Schools, Commission on Occupational Education, December, 1972), p. 12.

[9] Technical Specifications for Catalogs of Objectives and Assessment Items (Tallahassee, Fla.: Florida Department of Education, Educational Research and Development Program, 1971), p. 6.

a. Situation--The situation confronting the learner is clearly specified, including the mode in which stimuli are to be presented.

b. Action--The action required of the learner is unambigously defined, including the mode in which responses are made.

c. Objects--The object on which the learner is to operate (i.e., the object of the action) is clearly stated.

d. Limits--The particular limits associated with the activity expected of the learner as specified. (Limits may be placed on situation, action, and/or object.)

e. Measurability--The specified action is observable rather than an inferred response.

f. Communicability--The objective is so stated that one, and only one, interpretation of the objective is reasonably possible.

g. Criterion--The degree of proficiency required as evidence of accomplishment by a student of the objective indicated. (The criterion may be indicated implicitly or explicitly. If implicit, 100 percent accuracy is effectively designated. If explicit, may be appended parenthetically to the statement of the objective.)

Sub-activity. A description of a discrete element of work to be accomplished which leads to the accomplishment of the total activity.

Task analysis system. A method of reviewing actual job content and context in business and industry and applying the resulting information to the development of performance objectives, criterion-referenced

measures, and quality control devices within a program of vocational-technical education.

Task criticality. A characteristic of a task statement which makes its accomplishment crucial to the acceptable performance of a worker or student. A method of analysis which identifies the critical tasks and aids in determining the consequence of poor performance or lack of performance by a worker or student.

Task difficulty index. An index used to determine the relative difficulty of each task performed within the domain of interest. This information is collected from selected incumbent workers and their immediate supervisors.

Task list. A listing of tasks performed by incumbent workers within a domain of interest. An example is a listing of all tasks performed by an automotive mechanic or by a worker in ornamental horticulture.

Task perishability index. An index based upon selected incumbent workers' responses to a task list. The purpose is to determine the tasks which perish over a period of time if not used. This information supplies data to support retraining and/or self-paced instructional materials.

Task time-spent index. An index of relative time-spent on each task within a domain of interest and appearing on a task list. The task time-spent index is computed from scientifically selected samples of incumbent workers who respond to task listings.

VII. IMPORTANCE OF THE STUDY

The importance of the study is based upon the experiences of the State of Florida's Division of Vocational Education concerning the development of catalogs of performance objectives and criterion-referenced measures in occupational education. During a three and one-half year period, the Division of Vocational Education in Florida expended in excess of two-hundred thousand dollars through its Educational Research and Development Program for the development of four catalogs of performance objectives and criterion-referenced measures. The task of developing this new approach to curriculum and to improvement of instruction proved to be costly and time-consuming. Florida identified over two-hundred areas in occupational education which needed the same type of specific instructional development. Floyd T. Christian, Commissioner of Education, State of Florida, in his memorandum to the State Board of Education on October 31, 1972, cited the importance of the formation of a multi-state consortium to attack the problem on a larger scale and to share materials, costs, and possibly reduce the time required for completing the previously identified two-hundred areas needing development. Christian stated the following:

> In view of the enormity of the task facing the Division of Vocational Education in preparing catalogs of objectives and criterion measures for the more than 200 occupational courses now offered in Florida's schools, it has been recommended that steps be taken to secure external assistance. The attached contract would require the Southern Association of Colleges and Schools to investigate the feasibility of obtaining interstate cooperation in this venture, to contact and arrange for the participation of other states, especially those in the Southeast,

> and to present for our approval a plan of organization which is agreeable to all participants.[10]

As a result of Christian's memorandum and contract recommendations, the Southern Association of Colleges and Schools, COEI, conducted a feasibility study and organized a conference which was held in Atlanta on April 3-5, 1973. The conference was attended by representatives of 20 states. A motion was passed by the conference participants that an ad hoc Steering Committee serve on an interim basis until details could be worked out for the legal formation of the consortium.

Immediately following the conference, Felix Robb, Bob Childers, and the researcher met and discussed the status of the development of the Phase I Activity Model for V-TECS. After this meeting, letters to the Chairman of the researcher's Doctoral committee were prepared. The letters emphasized the importance of the study and its possible contribution to the new consortium effort. Copies of the letters are included in Appendix A.

Lancaster in the report of his study, "Conflict in Inter-Organizational Cooperation,"[11] supported the importance of a consortium having distinct goals and carefully delineated responsibilities. Lancaster made the following statement:

> There seems (sic) to be four central problem areas around which most consortium conflict develops:
>
> 1. Role and scope of the central office.

---

[10]Floyd T. Christian, Florida Commission of Education. From a memorandum to the Florida State Board of Education, October 31, 1972.

[11]Richard B. Lancaster, "Conflict in Inter-Institutional Cooperation" (Chicago: Loyola University, 1970).

2. Distribution of the limited resources of the inter-organization.

3. Heterogeniety of member institutions attempting to seek common goals.

4. Administrative procedures and management as the consortium develops.[12]

Lancaster contended that clearly defined procedures and explicit goals could add strength and focus to a consortium effort. He pointed out that "there has been a great upsurge in inter-institutional cooperation during the past fifteen years and that trend will increase significantly over the next fifteen years."[13]

Hughes and Achilles, in the report of a study of the trend toward cooperation and cooperatives in education, stated the following: "Cooperation in education is a concept receiving considerable attention today with more persistent reluctance of votors to support school bond issues and budgets."[14] The study further supported the findings of Lancaster concerning the need for explicit goal setting and the identification of common problems upon which to focus the cooperative effort.

Franklin Patterson, in a study of consortia,[15] supported the need for new approaches in consortia management with a strong need for more

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[12] Ibid., p. 5.

[13] Ibid., p. 4.

[14] Larry W. Hughes and C. M. Achilles, "Interpretive Study of Research and Development Relative to Educational Cooperatives" (Washington: National Center for Educational Research and Development, Department of Health, Education, and Welfare, United States Office of Education, 1971), p. 10.

[15] Franklin Patterson, "The Consortia: Inter-Institutional Cooperation in Higher Education" (Boston: University of Massachusetts, Ford Foundation Grant, 1973).

Participation by educational foundations and U. S. Office of Education funding. In his study of several selected consortia, Patterson stated the following:

> Those consortia depicted here serve at least to suggest where some of the real promise of cooperation tantalizingly lies. . . . in the use of new technology for the delivery of educational services, in some measure of rationalized academic program cooperation, in joint systems of recruitment, in cooperative curriculum development, and the like.[16]

The movement toward performance-based instruction for the learner is occurring at the same time as strong efforts toward performance or competency-based teacher preparation and certification and performance-based educational administration. This research project may serve as a timely and relevant effort with some possible general application of procedures to other academic fields.

VIII. NATURE AND SOURCES OF DATA

The data base of the study was derived from five distinct sources. The sources and the nature of the data were as follows:

1. On-Site Project Visitations. During the process of the study, the researcher visited six of the seven participating projects. Key individuals were interviewed. In each case, they provided descriptive materials of the projects. Emphasis was placed upon qualitative and descriptive information which explained details of the processes and procedures used to accomplish the purposes of the projects.

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[16] Ibid., p. 85.

In some cases, the data were both qualitative and quantitative.

2. Review of the Literature. A comprehensive review of related literature was conducted early in the research project. The review of literature provided a basis for an a priori selection of some activities and sub-activities used to develop the Phase I a Priori Activity Model. A detailed description of the source of each activity appears in Chapter IV. The review of literature also assisted the researcher in assessing the state of the art of certain major concerns related to performance-based instruction, educational accountability, educational consortia, and educational model development. The nature of the data collected as a result of the literature review was primarily qualitative and descriptive.

3. Review of Projects and Models Related to Performance-Based Instruction. A selection of seven projects and/or models was made for the purpose of establishing the Phase I a Priori Activity Model and for the development of Delphi Probe I. A review of the projects and models is included in Chapter II, Review of the Literature. The specific contribution of each project and model to the Phase I a Priori Activity Model is included, by source, in Chapter IV. The nature of the data which resulted from this activity was qualitative and descriptive.

4. Review Committee for Refinement of Delphi Probe I. An informal committee of persons was utilized to assist in the refinement, clarification, and general improvement of Delphi Probe I. The committee members were asked to read, edit, and respond to ambiguous items, terminology, and unclear instructions and to keep a record of the amount of time it took to respond to the Delphi I instrument. Data resulting from this activity were qualitative and quantitative and were used for

the purpose of improvement of the instrument. A listing of the committee members is included in Appendix B.

5. Jury of Experts. The jury of experts provided the data used to develop and validate the activity model for V-TECS. Data were collected through the use of three Delphi probes. The qualitative data obtained from the probes through the response mechanisms were reduced to quantitative data by use of numerical values for the responses. The numerical values are described in Chapter III of the report.

IX. ORGANIZATION OF THE STUDY

The study is organized into six chapters. Included at the end of the report are a comprehensive bibliography and appendix.

Chapter I includes the introduction, statement of the problem, analysis of the problem, assumptions, objectives, scope, definition of terms, importance of the study, the nature and sources of data, and organization of the report.

Chapter II, the review of related literature, included a study of: (1) the accountability movement, (2) performance objectives and criterion-referenced measures, (3) consortia, (4) model development theory, (5) the Delphi Technique, and (6) selected projects and models.

Chapter III contains the methodology used to conducct the study and a timetable for the study. The procedure used to develop the Delphi instruments and the method of selecting the jury of experts are described. The rules for administration of the Delphi probes are also explained.

Chapter IV includes the presentation of the Phase I a Priori Activity Model for V-TECS and a discussion of each activity and sub-activity. Information is provided concerning the source of the content. In addition to the Phase I a Priori Activity Model, an a priori sequencing chart was developed for use with the Delphi probes. The master sequence chart is included in Chapter IV.

Chapter V contains the presentation and discussion of the data collected as a result of the investigation. Various analyses of the data are presented with emphasis upon the convergence of opinion of the jury of experts. Data are also included in regard to instrumentation, response rates, and recommended sequencing of activities for the Phase II Activity Model.

Chapter VI contains a summary of the procedures, findings, conclusions, and recommendations.

CHAPTER II

REVIEW OF RELATED LITERATURE

I. INTRODUCTION

The review of literature was conducted for three basic purposes. The preliminary review was conducted to provide the conceptual framework for the contemplated research and to determine the state-of-the-art of research in the problem area. A second review of the literature was conducted six months later and focused on the determination of a research approach, methodology, instrumentation, and techniques for data analysis. The second review assisted in the statement of definitions, assumptions, limitations, and objectives for the study of the problem. The third review of literature was conducted to update and revise each of the topics presented in the review of the literature. The review of literature was presented in six areas considered to be relevant to the problem and were as follows:

1. Accountability in Education.
2. Performance Objectives and Criterion-Referenced Measures.
3. Educational Consortia.
4. Model Development in Education.
5. Projects and Models Reviewed for the Development of the Phase I Activity Model for V-TECS.
6. The Delphi Technique.

II. ACCOUNTABILITY IN EDUCATION

For many years, education has been regarded as the most important force working for the improvement of man and his society. This attitude still exists to a degree, but there are increasing numbers of people who are displeased with the products of the educational enterprise as it operates today. During the past few years, the college graduate has had increased difficulty in locating satisfactory employment in line with his college preparation. Many college graduates are accepting jobs below their level of training and educational achievement. At the same time, jobs are available which require technical skills and knowledge not matched to the qualifications generally held by college-trained people. The situation where men are searching for jobs and jobs are searching for men exists, and neither can match the requirements of the other. The problem is complex and is the result of years of some misdirection, unimaginative long-range planning, and a general disregard of the needs of the labor market by educators. The concerned public is demanding increased accountability of the educational establishment and is asking to be shown a relationship between education and the realistically determined needs of society.

Definitions of Educational Accountability

During the study of the literature, it became obvious that accountability means different things to different people. The definitions of accountability offered in the next few statements were collected from leaders in the field as well as from official position papers or publications of state agencies active in the educational accountability

movement. Lessinger's definition of accountability provides a positive basis for considering other points of view: "Educational accountability is responsibility for something to someone with consequences for the discharge of the responsibility sure to follow."[17]

Porter, Superintendent of Public Instruction, State of Michigan, defined accountability as:

> . . . the guarantee that all students, without respect to race, income, or social class, will acquire the minimum school skills necessary to take full advantage of the choices that accrue upon successful completion of public schooling, or we in education will describe the reasons why.[18]

Porter's definition supported and expanded on that offered by Lessinger. Porter further pointed out that accountability was not performance contracting, program budgeting (PPBS), cost-effectiveness, testing, merit pay for teachers, or a means of relieving teachers of their jobs.[19]

Albert Shanker, President of the United Federation of Teachers, supported Porter's description of what accountability is not. Shanker stated that accountability, as being proposed by some zealots of the movement, is a concept much feared by the classroom teacher. He further stated:

> Accountability is being viewed as a negative controlling force by some teachers . . . as another in the long string of innovations which is designed and implemented more in terms

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[17]Lessinger, A speech in Atlanta, Georgia, April 5, 1973, op. cit.

[18]John W. Porter, A Paper Entitled "Accountability in Education" from a book by Leon Lessinger and Ralph Tyler, Accountability in Education (Worthington: Charles A. Jones Publishing Company, 1971), p. 42.

[19]Ibid.

> of political or public relations value than for the real impact on improved educational practices.[20]

Dyer observed two distinct tendencies which appear to be working at cross purposes in the effort to hold educators accountable and to support properly a rational understanding of the concept. He stated that:

> . . . on the one hand, there is the tendency to force all units of the educational system into rigidly uniform operational patterns to provide the linkages among the units that seem necessary in a fluid and technologically interdependent society. On the other hand, there is the tendency to give each unit, however small, a free hand to work out its own destiny in light of the needs, aspirations peculiar to the students and the community that the unit is attempting to serve.[21]

Dyer further stated:

> . . . accountability, if it is to work, must reconcile these opposing tendencies . . . and in such a manner that understanding is clear and the desired results are measurable.[22]

The Florida Department of Education defined accountability as "the process of explaining the utilization of resources in terms of their contributions to the attainment of desired results.[23]

An analysis of the various definitions resulted in the identification of a trend in the accountability movement away from the

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[20]Albert Shanker, A Paper Entitled "Accountability: Possible Effects on Instructional Programs" from a book by Leon Lessinger and Ralph Tyler, Accountability in Education (Worthington: Charles A. Jones Publiching Company, 1971), p. 67.

[21]Henry S. Dyer, "How to Achieve Accountability in the Public Schools," Phi Delta Kappa Fastbacks, XIV (1972), 8.

[22]Ibid.

[23]Plan for Educational Assessment in Florida (Tallahassee: Florida Department of Education, Bureau of Research, Division of Elementary and Secondary Education, 1971), p. 11.

determination of educational program effectiveness in terms of process-oriented inputs toward a system which focuses primarily on the product or end result. The literature suggested that there was sufficient congruence in terms of the definitions of accountability but revealed little evidence of a concerted approach to the achievement of accountability.

Conditions Influencing the Emphasis and Concern for Increased Educational Accountability

Tyler stated the following in regard to the current emphasis on accountability:

> Three recent developments appear to have influenced the current emphasis and concern for accountability. . . . the increasing proportions of the average family's income that is spent on taxes, the recognition that a considerable fraction of youth are failing to meet the standards of literacy now demanded for employment in civilian and military jobs, and the development of management procedures by industry and defense that have increased the effectiveness and efficiency of certain production organizations.[24]

The "Second Annual Survey of the Public's Attitude Toward the Public Schools"[25] revealed many of the public's concerns for education which tend to support Tyler's statement concerning the increased amount of money being paid for taxes. In the Gallup study, the subjects of accountability, relevance, financial support, student power, drugs in the schools, sex education, and other related problems were discussed.

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[24]Ralph Tyler, "Accountability in Perspective," from a book by Leon Lessinger and Ralph Tyler, Accountability in Education (Worthington: Charles A. Jones Publishing Company, 1971), p. 1.

[25]George Gallup, "Second Annual Survey of the Public's Attitude Toward the Public Schools" (Princeton: Gallup International, October, 1970).

The third and fourth annual surveys conducted by Gallup tended to support the findings of the second survey. The results focused on some of the reasons why the public is reacting as it is toward education. Gallup strongly suggested that decisionmakers in education take stock of public attitudes or suffer the consequences of lost public support, both financially and politically. Gallup cited statistics and other findings from the U. S. Office of Education as follows:

> Budgets and bond issues are being voted down in increasing number. Evidence of this trend is to be found in the results of the present study. The U. S. Office of Education reports that in the last year (fiscal, 1969) school bond issues were voted down by voters at a record rate. By dollar value, voters approved less than 44 percent of the 3.9 billion in bond issues put to the electorate. The 1.7 billion that passed comprised the lowest total since 1962. A decade ago 80 percent of such bond issues were approved.[26]

Gallup further cited as primary reasons for voter concern the spiraling costs of education, the rising concern for lack of discipline in the schools, and the apparent inability of school administrators to deal effectively with student unrest. It was pointed out by Gallup that until recently the citizenry was willing to accept statements of boards of education, school administrators, and teachers regarding how well the schools and their programs were doing.[27]

An indication of the public's attitude toward an increased level of accountability for education was partially reflected in the responses to five questions asked by Gallup:[28]

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[26] Ibid., p. 3.

[27] Ibid.

[28] Ibid., pp. 4-5.

1. Would you like to see the students in the local schools be given national tests so that their educational achievement could be compared with students in other communities?

   Responses: Yes--75% No--16% N/A--9%

2. Would you favor or oppose a system that would hold teachers and administrators more accountable for the progress of students?

   Responses: Yes--67% No--21% N/A--12%

3. Should each teacher be paid on the basis of the quality of his work or should all teachers be paid on a standard scale basis?

   Responses: Work--58% Scale--36%

4. Many states have tenure laws which means that a teacher cannot be fired except by some kind of court procedure. Are you for giving teachers tenure or are you against tenure?

   Responses: For--35% Against--53%

5. Suppose the local public schools said they needed much more money. As you feel at this time, would you vote to raise taxes for this purpose, or would you vote against raising taxes for this purpose?

   Responses: For--38% Against--55%

Four of the five annual surveys of "The Public Attitude Toward Education" identified student discipline as the number one problem facing public education.[29] Through responses to questions in the Gallup surveys, concern was expressed for the apparent inability of school administrators to deal effectively with student discipline. The problems of student rioting, increased drug use, personal grooming, and school integration were predominant concerns.

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[29] Ibid., p. 4.

Support and Growth of the Accountability Movement

Findings of the Gallup Poll conducted in 1972 suggested increased interest on the part of publicly elected officials in bringing pressure on education to achieve higher degrees of accountability. One of the findings was as follows:

> . . . of the 1790 persons surveyed, 56 percent of them would vote against a tax increase for the schools even if they needed the increase, 36 percent would vote for the increase, and 8 percent held no opinion.[30]

Another area of investigation by Gallup was taxes. The following question was asked:

> It has been suggested that state taxes be increased for everyone in order to let the state government pay a greater share of school expense and to reduce local property taxes. Would you favor an increase in state taxes so that real estate taxes could be lowered on local property?

The finding was:

> . . . of the 1790 persons in the survey, 55 percent responded for the suggestion, 34 percent responded against it, and 11 percent had no response.[31]

The responses indicated a trend in support of education through taxation at the state level rather than through increased local taxation.

A trend toward increased state legislative actions concerning accountability was revealed in the literature. Lessinger identified two states, Florida and Colorado, which had enacted accountability legislation in 1970 and 1971.[32] Others, according to Lessinger, were considering

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[30]George H. Gallup, "Fourth Annual Survey of the Public's Attitudes Toward the Public Schools," Phi Delta Kappan, LIV (September, 1972), 33.

[31]Ibid., p. 43.

[32]Leon M. Lessinger and Ralph W. Tyler. Accountability in Education (Worthington: Charles A. Jones Publishing Company, 1971).

similar legislation. During a spring seminar in Atlanta, Georgia, in 1972, Lessinger stated that some 23 states had passed legislation or joint resolutions featuring some aspects of accountability.[33] In just over a year, the number jumped to 33 states with another dozen considering some form of action.[34] Elam noted that more than 4,000 books and articles had been written on the subject of accountability during the last four years.[35]

Implications for the Study

A system or model which organizes, improves, or expands educational programs or services should be developed with knowledge of the direction of accountability in education. Findings of the literature review support such movements as performance-based instruction, third-party assessment, performance contracting, performance-based teacher preparation, and competency certification of both teachers and administrators. The "systems design approach" and various program planning techniques, according to Butler, will increase as programs attempt to develop educational outcomes in terms of measurable student performance.[36]

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[33]Lessinger, A Speech in Atlanta, April 5, 1973, op. cit.

[34]Stanley M. Elam, Editor, "Holding the Accountability Movement Accountable," Phi Delta Kappan, LVI (June, 1974), 657.

[35]Ibid.

[36]Coit F. Butler, Instructional Systems Development for Vocational and Technical Training (Englewood Cliffs: Educational Technology Publications, 1972), pp. 41-53.

III. PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES

A positive and promising movement is underway in education which may be a step toward bringing accountability into the classroom. This effort is based on the development of performance objectives to be used as an integral part of instruction. In addition to performance objectives for the learner, a companion set of criterion-referenced measures is included for teacher assessment of the learner. Robert Mager is considered by many to be the contemporary father of the performance objective. He has written several books and articles designed to help implement the concept. A performance objective, as defined by Mager, contains at least three components:

1. The terminal behavior, specifically stated, which will be accepted as evidence that the learner has achieved the objective.

2. The desired behavior, including the important conditions under which the behavior will be expected to occur.

3. The criterion for acceptable performance which describes how well the learner must perform to be considered acceptable.[37]

As the concept has developed over the past several years, other components have been added to the early structure presented by Mager. The Florida Educational Research and Development Program[38] added components to statements of performance objectives which include Mager's

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[37]Robert F. Mager, Preparing Instructional Objectives (Belmont, California: Fearon Publishers, 1962), p. 12.

[38]Technical Specifications for Catalogs of Objectives and Assessment Items, p. 3.

three components and four others. The components are listed in Chapter I, Definition of Terms.

Simultaneously with the development of the performance objective has been the development of the criterion-referenced measure. The criterion-referenced measure attempts to explain an absolute gain in learning and performance in terms of a required standard. Glaser presented one of the more basic definitions of the criterion-referenced measure when he said that they were measures which assess student achievement in terms of a criterion standard and provide information as to the degree of competence attained by a particular student independent of references to the performance of others.[39] The Florida Educational Research and Development Program[40] defined the criterion-referenced measure as:

> . . . an exercise based upon an objective and designed to allow the determination of whether or not the learner has accomplished the objective. It possesses each of these characteristics: congruence, comprehensibility, objectivity, integrity, and equivalence.

The concerns about the use of criterion-referenced measures are due partially to the resistance of test experts who have not yet fully developed a system for establishing validity and reliability for this type of measure. The conditions of variability which form the basis for the analysis of norm-referenced tests are not present in criterion-referenced measures. The student, in a performance-based class, is

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[39] W. James Popham, Editor, Criterion-Referenced Measurement (Englewood Cliffs: Educational Technology Publications, 1971), p. 8.

[40] Technical Specifications for Catalogs of Objectives and Assessment Items, p. 7.

given a performance objective expressing explicit requirements and a standard of competence required for determining successful performance which is usually stated in terms of actual on-the-job requirements and standards.[41] The student either does or does not perform to meet the standard. This characteristic of the criterion-referenced measure makes analysis in terms of variance non-existent.

However, work on methods of analyzing criterion-referenced measures is being accomplished. James Popham and the late F. R. Huseck experimented with statistical analysis of criterion-referenced measures in recent years. As a result of their work and the work of Cox, Vargas, and Scott, a body of knowledge is being developed regarding analysis of criterion-referenced measures to assist in the improvement of these test items.[42]

Ebel raised the question of whether criterion items must have measurable validity. He contended:

> . . . if criterion items successfully measure the performance desired of the learner as stated in an objective and are capable of repeatedly doing so, then perhaps this is a way of validating the criterion-referenced measure.[43]

An advantage of performance objectives and criterion-referenced measures is their ability to place the student in a meaningful relationship with a domain of knowledge and applied skills. The abilities and

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[41] Instructional Systems Materials Development, Air Force Manual 50-2, Department of the Air Force (Washington: U. S. Government Printing Office, 1973), pp. 4-11.

[42] Popham, op. cit., pp. 81-83.

[43] Robert L. Ebel, Essentials of Educational Measurement (Englewood Cliffs: Prentice-Hall, Inc., 1972), p. 36.

competencies of the student are directly related to his individual effort and application to the task at hand. The basic difference between the criterion-referenced measure and the typical norm-referenced measure is that student progress on a criterion-referenced measure is in relation to the outside standard; the norm-referenced measure compares the progress of the student with the relative progress of other students in the course or program.[44] Popham stated:

> What is needed is not an abandonment of the norm-referenced approach but rather a supplement of criterion-referenced tests which provide information in addition to the fact that "Suzy" can do more than "Johnny." The criterion test provides specific information on how well "Suzy" is able to do what she does that exceeds what "Johnny" is able to do.[45]

Some educators fear that such a degree of accountability in terms of student performance and competency certification will lead to indiscriminate evaluation of teachers by those outside the classroom. Shanker commented on increased accountability through more specific measures of teacher performance and learner outcomes. He made the following statement:

> I think (sic) the first thing that needs to be said about accountability from the point of view of the teacher is that the concept is very much feared.[46]

Shanker's primary concern with specifying each step of the learning process and the teaching process was that it might have the potential for turning classrooms into "factory-type" situations and children into

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[44]Popham, op. cit., p. 44.

[45]Ibid., p. 47.

[46]Lessinger and Tyler, op. cit., p. 66.

"machinelike" members with every hour of the school day carefully monitored. Shanker conceded that if the development of performance objectives and criterion-referenced measures was to be a positive and constructive force in the classroom which would produce a higher degree of instructional accountability on the part of the teacher and the learner, he would support the idea. He made the following statement:

> So long as the objectives are not so narrow as to turn children into machines but also not so broad as to make measurement impossible, this positive advantage to improving instruction has great merit.[47]

The "systems approach" to performance-based instruction is gathering force and momentum. According to Butler, the "systems approach" is:

> . . . a process which involves the accurate identification of the requirements and problems, the setting of specific performance objectives, the application of logic and analysis techniques to the problems, the development of methods for the solution of the problems, and the rigorous measurement of the product against the specific performance objective.[48]

A systematic approach to the scientific identification of what should be taught in a vocational-technical program, with various strategies for converting the information into meaningful and valid performance objectives, appears to be needed and can be justified based upon trends identified in the literature.

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[47] Ibid., p. 69.

[48] Butler, op. cit., p. xi.

IV. EDUCATIONAL CONSORTIA

In the literature, the word consortium is used synonymously with educational cooperative, interinstitutional cooperation, institutional cooperation, cooperative programs, and other modifications of these terms. The primary focus of the review of literature presented in this section was to identify trends in administration, operation, governance, and finance which would contribute to the development of the activity model for V-TECS.

The wide use of terminology such as mentioned in the first paragraph caused the researcher to adopt Lewis Patterson's[49] criteria to limit the scope of the investigation of consortia activities. Consortium reports, studies, articles and books were reviewed if they met the following criteria:

1. Was a voluntary formal organization.
2. Had three or more member institutions.
3. Had multi-academic programs.
4. Was administered by at least one full-time professional.
5. Had a required annual contribution or other tangible evidence of long-term commitment of member institutions.

Growth of Cooperation in Education

The Consortium movement has been one of recent and extensive growth. Franklin Patterson stated,

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[49]Lewis D. Patterson, 1973 Consortium Directory (Washington: American Association for Higher Education, 1973), p. 5.

> . . . between 1925 and 1965 only nineteen consortia were developed which met the five-point criteria used by Lewis Patterson. . . . in the five-year period between 1965-70 thirty-two more came into being. . . . and as of this writing over half of the consortia existing have been organized within the past five years.[50]

The growth in the formal consortium movement which met the Patterson criteria is a rather pale indication of the increase in cooperation in education. Patterson identified 80 such consortia which met his criteria, including 797 institutions primarily composed of representatives of higher education.[51] Moore identified 1,017 existing consortia and admitted that evidence existed that many consortia were not reported.[52]

Hughes and Achilles[53] conducted an exhaustive study of research and development relative to educational cooperatives. Their study identified numerous trends toward cooperatives and cooperation in education. The study included reviews of 32 cooperative efforts in 19 states involving numerous local school systems. Hughes and Achilles included study instruments which were responded to by 51 School Study Councils collected by Danenburg in 1969-70.[54] Hughes and Achilles cited one reason for the increase in the growth of cooperation in education:

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[50]Franklin Patterson, op. cit., p. 4.

[51]Ibid.

[52]Moore, op. cit., p. 4.

[53]Hughes and Achilles, op. cit., p. 161.

[54]Ibid., p. 162.

> . . . cooperation in education is a concept receiving considerable attention today with the more persistent reluctance of voters to support school bond issues and budgets.[55]

The Hughes and Achilles contention was firmly supported by George Gallup's Annual Survey of the Public's Attitude Toward the Public Schools conducted in 1971.[56] An indication was shown by the Gallup Survey that the public was concerned about increasing costs of education, what was being delivered by the schools in terms of these costs, and how effective local school programs were in comparison to state regional and national norms.

Some Reasons for Consortium Efforts

Evidence presented by Moore indicated that consortia have pools of expertise to solve educational problems, share research efforts and findings, pool resources (financial) to bring about a greater impact on the solution of a problem, develop and expand special programs, and facilitate shared services such as data processing systems and hardware, expensive research staff, facilities, expensive pieces of specialized instructional equipment, and development of instructional software.[57]

Lancaster in research on conflicts in consortia suggested that a less formal reason existed for cooperation:

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[55] Ibid., p. 10.

[56] Gallup, "Third Annual Survey of the Public's Attitude Toward the Public Schools," op. cit., p. 33.

[57] Moore, op. cit., pp. 8-10.

> The cooperative efforts often result for no apparent reason and many institutions do not know why they join cooperative ventures.[58]

He stated that the primary reason appears to be that institutions join cooperative efforts for the sake of cooperation alone. Some consortia develop to solve problems or groups of problems which may be solved through a cooperative effort with a saving in staff time, effort, and in some cases, at a reduced cost. Usually, the problem or problems are of such magnitude that the individual institutions or agencies cannot solve them.

Some Problems and Barriers to the Growth of the Consortium Movement

Problems of the consortium movement deserve an in depth study, especially when considered in view of the current movement toward accountability in education. One major weakness in the consortium effort is the lack of well-defined responsibilities for its members and for the central staff. Lancaster contended the following in regard to consortia:

> The central assumption of the research is that as cooperation creates interdependency, conflict and competition increase in the consortium. This is not something that can be prevented--or should be prevented. No amount of goodwill, or best intentions, or nice guys can avoid conflict in an organization that is serious about cooperation. In an interorganization of independent and autonomous institutions, conflict is characteristic--a given of the association. Sociologists of the Talcott Parsons School tend to see conflict in an organizational effort. Most administrators view it this way also. In the typical monocratic hierarchical structure, harmony is the goal and consensus is administered from the top. However, in an interorganization--a consortium--conflict and competition may serve a positive function (e.g., defining

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[58]Richard B. Lancaster, "Conflict in Interinstitutional Cooperation," A paper delivered at an Academic Consortium Seminar (Chicago, Ill.: Loyola University, March 1, 1970).

boundaries, generating search behavior, providing a sense of independence), and should be accepted and legitimatized.[59]

Based upon the findings of his research, Lancaster stated two things about conflict and cooperation:

1. Cooperation leads to conflict.
2. Conflict should not be avoided.[60]

Lancaster pointed out in his study that there seem to be four central problem areas around which most consortium conflict develops:

1. Role and scope of the central office.
2. Distribution of limited resources of the interorganization.
3. Heterogeneity of member institutions attempting to seek common goals.
4. Administrative procedures and management as the consortium develops.[61]

The Lancaster study has implications for new consortium development. It was found that conflict could be held to a healthy minimum if certain conflict management devices were employed. In the organizational structure and/or agreement forms, there should appear a clear and complete division of labor, a system of internal checks and balances, development of coalitions with other agencies outside the consortium (this tends to reduce inter-dependency), and the development of an ethos of voluntarism. Lancaster concluded:

> Certainly further research needs to be done with regard to these modest insights from one case study. The implication, however, is clear: conflict is a considerable factor in consortium life. For those who would administer a consortium,

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[59] Ibid., p. 4.

[60] Ibid.

[61] Ibid., p. 5.

> this raises the fundamental question of whether their task is best understood in terms of the corporate or the political model. The toleration of conflict accepted and legitimatized through appropriate structures is the essential difference between the corporate and the political approach to understanding organizational relationships. In the past, higher education has borrowed insights and generalizations from the traditional corporate model--we all read our Bernard, Carson--but in view of this research and the political model seems more appropriate to understanding the consortium.
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> Burton Clark has suggested that patterns of interorganizational behavior lie "somewhere between the ways of concerting action that are commonly found in corporations and those found in the political arenas." He may be right, but too often we lean toward vain or romantic notions of our roles. This brings us back to the rational in higher education which we discussed at the beginning. Let me propose that the consortium presidency, like that of a college or university, is a political office. No one who lacks a zest for political action should accept the presidency of a consortium.[62]

Patterson,[63] in his study of basic governance aspects of 51 selected academic cooperative arrangements, noted that the average age of the consortia studied was 8.0 years. He further cited that 77.3 percent of the membership of the consortia consisted of private institutions. This disproportionate private membership may indicate more cooperation is ahead in public education as funds become more difficult to obtain. The private institutions have experienced a financial squeeze in recent years which may be a reason for their higher rate of participation in cooperative matters.

The consortium concept has potential for fostering exchange of personnal, procedures, pooling of equipment, funds, etc., and for

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[62] Ibid., p. 11.

[63] Lewis Patterson, "A Descriptive Study of the Governance of Selected Voluntary Academic Cooperative Arrangements in Higher Education. (Unpublished Doctoral dissertation, University of Missouri, Kansas City, 1971).

providing a basis for innovative practices in education. Lancaster,[64] in his study of interdependence and conflict in consortia, identified two threats to cooperation on a large scale: (1) maintenance of institutional or agency autonomy, and (2) uneasiness resulting from high degrees of interdependency. The fear of too much dependency on another institution to solve problems common to both requires a dedication to cooperation first and institutional autonomy second. This structural conflict can become functional if identified early enough and directed toward positive end results. Jordan,[65] in her study of the functions of the forces of autonomy, cooperative interdependence, and conflict, concluded that "structural conflict was functional when the members of a confederation values their cooperative relationship."

Based upon current studies of the consortium movement, two factors appear consistent. First, the groups forming the consortium should have clearly stated goals and activities, homogeneous in nature, and, second, a means for handling interorganizational conflict should be developed early to prevent conflict from having a dysfunctional effect within the organization.

Franklin Patterson's[66] recent book, Colleges in Consort, firmly supported the findings and recommendations of the Lewis Patterson and

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[64]Richard B. Lancaster, "Interdependency and Conflict in a Consortium for Cooperation in Higher Education: Toward a Theory of Interorganizational Behavior" (Unpublished Doctoral dissertation, University of Michigan, 1969).

[65]Mary Agnes Jordan, "The Functions of the Forces of Autonomy, Cooperative Interdependence and Conflict in Two Confederations of Higher Education" (Unpublished Doctoral dissertation, University of Notre Dame, South Bend, 1970).

[66]Franklin Patterson, Colleges in Consort, op. cit.

Mary Jordan dissertations. Franklin Patterson cited five conclusions based upon his study of 55 consortia in higher education which synthesize the literature and pinpoint the major barriers to cooperation on a large scale. The major barriers were as follows:

1. The need for maximum effective voluntary cooperation by groups of colleges and universities is critical.

2. The consortium effort is not adequately meeting this need.

3. The principle direct impediment to effective interinstitutional cooperation is the traditional commitment of colleges and universities to institutional autonomy.

4. Institutional autonomy should be modified, not killed; and for most institutions, voluntary cooperation may be the only means by which they can survive at all.

5. The achievement of an adequately effective consortium movement will depend on intelligent outside intervention and support.[67]

Patterson contended that to date consortia have lacked the ability to gather substantial financial support from foundations and governmental sources. His explanation of this contention was that consortia, for the most part, have dealt with rather small specialized problems and have made only meager attempts to deal with some of the more complex and expansive problems and issues facing education. Shifts in financial support of consortium efforts may stimulate the solution of larger problems, according to Patterson.[68]

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[67] Ibid., pp. 191-121.

[68] Ibid., p. 121.

V. MODEL DEVELOPMENT IN EDUCATION

During the review of literature on the use of model theory in education, it became evident that some confusion exists between the systems approach and model theory. In some cases, the terms were used interchangeably. According to Hall and Fagan, a system was defined as:

> . . . a set of objects together with relationships between objects and their attributes. Objects are seen as parts or components of a system, attributes as properties of objects, and relationships as the wherewithal to tie the system together.[69]

Ryan offered the following definition of a system:

> . . . bounded organization of interdependent, interrelated components maintained in a stable state of relatedness to each other, the total system, and the environment by standard modes of operation and feedback from the environment for the purpose of accomplishing stated goals.[70]

A clear definition of an operating system was offered by Heinich:

> . . . an operational system synthesizes and inter-relates the components of a process within a logistical framework, ensuring continuous, orderly, and effective progress toward a stated goal. . . .[71]

Systems appear to be defined as broad modes of operation both natural and manmade. The solar system, circulatory system, financial

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[69] A. D. Hall and R. E. Fagan, "Definitions of a System," Modern Systems Research for the Behavioral Scientist (Chicago: Adline Publishing Company, 1968), p. 18.

[70] T. Antoinette Ryan, "Systems Techniques for Programs of Counseling and Counselor Education," Educational Technology, June, 1968, p. 8.

[71] R. Heinich, "A System of Instructional Management," Unpublished paper, 1962, as reported in L. C. Silverman, Systems Engineering of Education I: Evaluation of Systems Thinking in Education (Los Angeles: Education and Training Consultant Company, 1968), p. 4.

system, quality control system, management system, and teaching and instructional system all suggest a rather broad use of the term "system." Silvers contended that "a system is what the person identifying it says it is."[72]

Modeling appears to be more focused and tends to deal with real concepts rather than concentrating on abstract conditions. Silverman defined a model as follows:

> . . . a conceptualization in the form of an equation, a physical device, a narrative or graphic analog representing a real life situation. Consequently, the ideal is always a concept of real life either as it is or as it should be, and the model has a degree of fidelity appropriate to the purpose for which it is created.[73]

Ryan's definition of a model states that:

> A model is simply an abstraction of the real world in an attempt to represent reality. To build a model, one simply selects those elements from the system under analysis which one deems as being relevant to the problem. Very seldom, if ever, would such a model contain all the elements of the system being modeled. Complex models used with electronic computers may represent several aspects of the real world situation but to represent all aspects of most systems would be a prohibitive task.[74]

Agreement on what constitutes a model seems high in the literature. Wallhaus defined models in a similar manner as Ryan but classified them into four basic types with possibilities for combinations of the properties of each type. The four classifications offered by Walhaus were as follows:

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[72] Ibid., p. 27.

[73] Ibid.

[74] Ryan, op. cit., p. 27.

1. Structural models--limited to depicting the elements of the systems and the relationship (graphical representation).

2. Functional models.

3. Iconic models--looks like the object it represents.

4. Analogue models--substitutes one property for another.[75]

From the various definitions, models are simply physical or abstract representations of some real object, situation, or activity. In addition, models may be said to represent the real world by use of mathematical forms or examples, graphic forms or examples, narrative forms or examples, and combinations of all three types. In order to design a model, Wallhaus said that the purpose must be identified. Once this is accomplished, models are generally used in at least one of the following ways:

1. They may permit feasible and economical experimentation on real-world systems without incurring the costs, risks, and expenditures of time which may be required in actuality.

2. They allow us to formulate, communicate, and discuss hypotheses.

3. They bring about an understanding of the systems variables and their relationships.

4. They make it possible to forecast and project for planning and decision making.

5. They allow control of the time scale, Real-world processes occur over long periods of time. Modeling can allow long time intervals to be collapsed.

6. They enable us to control and monitor real-world processes.[76]

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[75]R. A. Wallhaus, "Modeling for Higher Education Administration and Management," Management Information Systems in Higher Education: The State of the Art (Durham, N. C.: Duke University Press, 1969), pp. 125-126.

[76]Ibid., p. 127.

Some Advantages and Disadvantages of Modeling

Models have certain inherent advantages and disadvantages. The decision concerning whether the advantages outweigh the disadvantages for solving a particular problem rests in the methodology used to validate the model. A model should be developed by use of the best data available or through data collection devices for validation.

> . . . models without data are sterile. What is needed is not merely more data but the right data in the right form. To collect and record data meaningfully requires at least a working hypothesis as to how it will be used; without this, there is no rationale for deciding what data to collect, no principle for ordering data, once gathered. To be useful, data must be kept over time so that it can be used for trends, time series, and comparisons.[77]

Wallhaus added words of caution concerning those who develop models and become obsessed with data collection and analysis:

> The model cannot be data driven, that is, entirely influenced by what data are available; but it is unrealistic to construct a model and then hope that the necessary data can be obtained.[78]

Advantages

According to Kraft and Latta, modeling permits the realization of the following advantages:

1. Models provide a simplified abstraction of a complex real-world problem.
2. Models provide a frame of reference for consideration of the problem.

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[77]Maurice Kilbridge, Robert P. O'Block, and Paul V. Teplitz, "A Conceptual Framework for Urban Planning Models," Educational Technology, XV (February, 1969), 28.

[78]Wallhaus, op. cit., p. 129.

3. Models sometimes suggest information gaps which before were not immediately apparent.

4. Models provide a "handle" to evaluate and study complex problems.

5. The construction or attempt to construct a model forces one to truly analyze as many of the real-world attributes as possible.

6. Models provide something which can be manipulated.

7. Models often provide the least expensive way to accomplish objectives.[79]

Disadvantages

Kraft and Latta identified three basic disadvantages or weaknesses of modeling as follows:

1. Models are subject to the usual dangers encountered in dealing with abstractions. For example, the model may be greatly over-simplified and/or not a valid model of the desired object system.

2. The symbolic language used to represent a model may lend itself to being stretched to encompass the model.

3. Some people have the tendency to become "hung up" or infatuated with a model; and, as a result, their effectiveness in offering a solution to the problem becomes very limited.[80]

Education has for the most part adopted and modified most of its models from business and industry, particularly from the field of scientific inquiry and engineering. Program Planning and Budgeting System (PPBS), Management by Objectives (MBO), and Program Evaluation

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[79]H. P. Kraft and Raymond F. Latta, "Systems Engineering Techniques: Embarrassment or Opportunity for Today's Educators?" Educational Technology, XV (September, 1969), 25-26.

[80]Ibid., pp. 27-28.

Review Technique (PERT) appear to be the most widely adopted general models being applied to educational management. Evidence throughout the literature revealed the adoption of instructional systems design (ISD) and performance-based teacher preparation (PBTP) to be of high priority in many areas of education. The systems approach and use of modeling will probably increase in the management of education as the public places increasing demands for high levels of accountability. Trends in the literature point in that direction.

VI. SPECIFIC PROJECTS AND MODELS STUDIED FOR THE DEVELOPMENT OF THE PHASE I A PRIORI ACTIVITY MODEL FOR THE VOCATIONAL-TECHNICAL EDUCATION CONSORTIUM OF STATES

Seven models and/or projects were studied concurrently with the related literature to form the basis of the Phase I Activity Model for V-TECS. Specific contributions of each model and/or project are cited by sub-activity in Chapter IV of the report. The reports of each particular project in this section were designed to briefly introduce and describe the projects and/or models and to cite strengths and weaknesses. Each project and/or model was studied in terms of its approach as compared with other approaches studied or in terms of trends identified in the literature.

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[81]Hubert F. Worthy, Branch Director, Technical Institute Branch, Alabama Division of Vocational-Technical and Higher Education, Montgomery, Alabama, Memorandum to Directors of State Technical Institutes, November 10, 1972.

Alabama Project

The efforts to develop measurable objectives in the State of Alabama through the Division of Vocational-Technical and Higher Education were primarily focused upon the post-secondary programs.[81] The development of performance objectives was supported at the highest administrative levels, including the State Director of Vocational-Technical and Higher Education and appropriate Branch Directors at the next level of administration.[82] Involvement was comprehensive but centered primarily upon instructors, assistant directors in technical institutes and area vocational-technical schools, and state supervisors in the service areas of Distributive Education, Agriculture, Technical, Office and Business, Trade and Industrial, Home Economics, and Health Occupations.[83]

Description of the Project

The task of developing performance objectives for all programs in the post-secondary institutions (technical institutes and area vocational-technical schools) was undertaken through three basic approaches:[84] (1) use of in-service workshops and seminars, (2) use of a consultant from outside the state, and (3) use of selected texts

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[82] T. L. Faulkner, State Director, Vocational-Technical and Higher Education, Montgomery, Alabama, Memorandum to Directors of State Technical Institutes and Assistant State Supervisors, November 28, 1972.

[83] T. L. Faulkner, State Director, Vocational-Technical and Adult Education, Montgomery, Alabama, Memorandum to Assistant Directors, State Technical Institutes, Selected Branch and District Supervisors, January 31, 1973.

[84] Ibid.

and references on performance objectives, development, and implementation, supplemented by a packaged program including filmstrips, slides, and tape cassettes produced by a commercial company. Time schedules were developed which identified the periods for orientation, instructor preparation for writing performance objectives, and delivery dates for preliminary drafts of objectives.[85] The procedures of control and responsibility were clearly explained in memoranda from the office of the State Director of Vocational-Technical and Higher Education and/or appropriate Branch Directors. A person was named to coordinate the instructors' work in each of the 27 schools participating in the project. In most cases, this person was the assistant director of the institution. Instructors were organized by program area and assigned certain units to develop and submit. A review committee was utilized to organize and edit the work of the various committees of instructors. Resource persons were available from the State Department of Education, Division of Vocational-Technical and Higher Education to assist committees of instructors and review committees in the accomplishment of specific tasks. Feedback was designed into both committee efforts primarily through the person designated in each school to coordinate the efforts of the instructors. Feedback also occurred through reactions to the draft versions of the performance objectives by instructors in the program area under development.

The review committee included an assistant director of an institution as chairman, a state supervisor of the program area, and

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[85]Faulkner, Memorandum dated November 28, 1972, op. cit.

three to five key instructors from northern, central, and southern regions of the state.[86] The project began late in 1971 and was scheduled to be completed and implemented during the fall quarter of the 1973 school year. Included in the project design were provisions for involvement of craft advisory committees.

Strengths of the Project

The major strength of the project appeared to be the provision for a broad base of involvement. Twenty-seven schools, the state staff, and advisory groups were involved at various times throughout the development and implementation of the performance objectives. A resource person who was prepared to direct and assist instructors in each school in the writing and selecting of appropriate performance objectives further supported the broad base of involvement. A rather comprehensive use of various types of committees provided additional participation.

A secondary strength which seemed to provide force and direction to the adoption of performance objectives by programs was the top level administrative support. It is questionable whether sufficient progress could have been made without the administrative and financial support provided by the top official.

Weaknesses of the Project

Based upon the materials supplied the researcher for review and study, the following weaknesses were identified:

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[86]Faulkner, Memorandum dated January 31, 1973, op. cit.

1. A lack of a thorough task analysis of jobs to provide the basis for programs of performance objectives.

2. A lack of broader participation of outside resource persons with specific expertise in some of the problem areas encountered during the development of the project.

3. Insufficient input and use of craft advisory committees.

4. A general lack of a state-or-the-art study to determine performance objectives developed by others outside of the State of Alabama which may have been appropriate for projects under development.

5. Lack of a well defined procedural model to guide the work of the various committees developing performance objectives.

Utah Project

The Utah Project was developed as a result of funds provided by the U. S. Office of Education in a grant to the Aerospace Education Foundation, Washington, D. C. The project lasted for 18 months with the primary purpose of determining whether U. S. Air Force courses and teaching materials could be utilized in the Utah public school system.[87]

The Utah Division of Vocational-Technical Education of the State Department of Education met with Air Force Association members and the Aerospace Education Foundation's Educational Technology Advisory Committee. Using a ten-year manpower needs projection, three priority areas with parallel Air Force courses were selected. The three areas were

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[87]"Utah Project: Air Force Training Goes Civilian," Air Force Magazine, III (March, 1972), 10.

electronics, medical service specialist (nurse's aide), and aircraft maintenance. Nineteen courses were identified by Air Force training specialists as having applicability to the broad areas identified. Course materials which included workbooks, audio-visual aids, demonstration equipment, etc., were selected, organized, and made available to six pilot project schools. Experimental groups were established using various designs of traditional approaches, Air Force approaches, and a combination of both approaches.

Two additional phases of the project were funded by the U. S. Office of Education. Phase II consisted of a grant to the Aerospace Education Foundation to expand on the experiences of the Utah Project, Phase I, conduct an inventory of all Air Force technical training courses, and determine those courses which had a high degree of transferability of training to civilian vocational-technical programs and jobs. Phase II did not relate as heavily to the State of Utah. It was designed to provide a central clearinghouse for vocational-technical education programs to access the Air Force training materials. Concerted efforts were made to remove all military acronyms, abbreviations, codes, and special numbers which had little or no meaning to the population in the civilian sector who would be the primary users of the materials.

The purpose of the Phase III project was:

> . . . to develop and field test, in an actual classroom setting, a course of instruction specifically designed for vocational-technical educators, both administrators and teachers, on the effective use of criterion-referenced materials, utilizing existing resources to a maximum in the course design. The object was to determine what teachers would need to be able

> to do to manage a criterion-referenced course, and to develop and test a course of instruction that would facilitate their development of those skills.[88]

One of the findings of Phase I in Utah was that most civilian vocational-technical programs were not criterion-referenced and that teachers were not accustomed to implementing and managing the Air Force type of training. Phase III was designed to overcome this barrier and to work with administrators and supervisors who had the potential for becoming impediments to implementation of the concepts of criterion-referenced instruction. One of the major outcomes of the project was to gain the support of the administrators and supervisors so that implementation of criterion-referenced instruction could occur in the classroom with support and understanding.

Description of the Project

Utah Project--Phase I: Six pilot projects were selected and materials were tested under rigorous processes of examination and experimentation. Teachers who participated in the project attended various informal workshops and visited the Air Force bases when the parallel courses were taught. Interesting results occurred as the project developed:

> For the nurse's aide test, one group received the Air Force instruction while the other got the conventional instruction. It became clear as the experiment got under way that the military and civilian instruction were marching to different

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[88] James H. Straubel, "Development of a Course for Training Vocational-Technical Educators on the Effective Use of Criterion-Referenced Materials" (Washington: Aerospace Education Foundation and U. S. Office of Education, April, 1972), p. 3. (Project No. OEC-0-70-4980-399.)

> drummers. The Air Force approach to the teaching of all three courses was performance oriented, unlike its civilian counterpart. Given a specific amount of instructional input, for instance, the Air Force demanded an equivalent performance level from its students. If the course was designed to train aircraft maintenance mechanics, then the Air Force expected to produce an aircraft maintenance mechanic at the end of a specific period of instruction. The approach to the same subjects in the civilian schools tended to be more loosely organized. Less attention was given to specific objectives. The Air Force course in electronics could qualify a student for a job as a basic technician in industry. The same student going through a conventiona electronics course, however, would come out with nebulous skills, and he would require retraining before he could do the same job. The Air Force courses, in addition, leaned heavily on audiovisual aides and programmed instruction. Much of the instruction consisted of films that led the student through the course materials in easy-to-understand stages. Each film ran between ten and forty minutes. During pauses on the screen, the instructor in the film had the students answer questions on a predistributed study guide. Students also used laboratory manuals that were an extension of the filmed lessons.[89]

The students and teachers involved in the project, for the most part, had nothing but praise for the Air Force materials and procedures. In the Final Report, the following statements were made concerning the Utah Project.

> The results, supported by empirical data, indicated that the use of Air Force techniques and materials resulted in student performance as good or better, in each instance, than student performance resulting from the use of conventional techniques and materials. In one instance (nurse's aide) as good or better student performance was obtained in about half the class time needed for the conventional course. All of these results were achieved with little or no modification of Air Force materials and, in one instance (aircraft pneudraulics) with the use of only one-third the equipment prescribed for the Air Force course segment.
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> The follow-up action and reaction of Utah educators has been equally impressive. For example, in each subject area studied, Air Force techniques and materials now have been integrated into

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[89]"Utah Project: Air Force Training Goes Civilian," pp. 12-13.

> the regular curriculum in each of the test schools, and in other Utah schools as well. Further, state-wide application of electronics instruction based on specified performance objectives, a key element of the criterion-referenced Air Force courses, is now in progress. Utah educators have asked for the subsequent phases of the electronics principles course as well as other courses, ranging from solid state devices through computer programming, all at Utah's expense.[90]

Utah Project--Phase II: The Phase I effort stimulated the U. S. Office of Education to fund Phase II of the project. The Aerospace Education Foundation effort included the screening of instructional materials, courses, etc., used by the Air Force in technical training to determine those which could be converted for civilian use. This task was accomplished as of January 31, 1971, with the submittal of the Final Report to the U. S. Office of Education. The report consisted of a rigorously developed inventory of 82 courses representing 498 instructional blocks, 26,083 hours of instruction, 198,471 printed pages, 419 hours of 16mm films, 30,973 still visuals, and 56 hours of audio tape.[91] The course review ranged in length from 29 hours to 1,289 hours.[92] Another interesting result of the inventory was that 81 percent of all materials reviewed were judged to be civilian related.[93]

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[90] James H. Straubel, Inventory of Air Force Vocational Course Materials for Possible Adaptation to the Civilian School Systems (Washington: Aerospace Education Foundation, January, 1971), p. iv. (Contract No. OEC-0-70-4980.)

[91] Ibid., p. xi.

[92] Ibid.

[93] Ibid.

Utah Project--Phase III: During Phase I and Phase II of the project, the Aerospace Education Foundation, Utah Division of Vocational-Technical Education, and the Air Force training personnel identified certain problems which needed attention in order to implement successfully the criterion-referenced instruction and to obtain maximum utilization of Air Force materials on a broad basis. As a result of the identification of the problems, Phase III was funded. Phase III consisted of designing a course which would enhance the implementation of criterion-referenced instruction by increasing the involvement of administrators and supervisors having responsibility for instruction along with instructional personnel who would be redesigning their programs for a criterion-referenced approach. The course was designed in criterion-referenced terms so that each participant could progress at his own rate. Terminal performance objectives and a comprehensive course map were developed to ensure complete coverage of the course and demonstrated performance on the part of all participants. The course organization was quite rigorous, but time frames remained flexible to provide for individual differences.

Strengths of the Project

Utah Project--strengths of Phase I:

1. The flexible and informal approach used to introduce selected pilot projects to the Air Force materials was well conceived and planned as an integral part of all project activities.

2. The basic research for determining which programs would be field-tested provided a sound foundation for planning courses which were

likely to produce persons in high demand areas in terms of labor market needs.

3. The involvement of Utah State Department of Education personnel, on an extensive basis, along with instructional personnel in the state apparently resulted in a high degree of participation and implementation of Air Force materials.

4. The identification of the need to inventory all technical training in the Air Force and to determine its applicability to civilian vocational-technical programs provided a rationale for broad dissemination of the Utah products and processes.

Utah Project--strengths of Phase II:

1. A rigorous and in-depth analysis of Air Force training programs and the determination of their applicability to civilian vocational-technical education programs were the primary strengths of Phase II.

2. The systematic design of an inventory technique which could be used to review technical training programs in other branches of the military and determine their applicability to civilian vocational-technical programs was developed during Phase II and was a major strength.

3. The determination that Air Force material could be purged of the military jargon and readily converted for civilian utilization at a reasonable cost was a significant result of the Phast II activity.

Utah Project--strengths of Phase III:

1. Phase III was designed to eliminate one of the major weaknesses of Phases I and II, the inadequate preparation of personnel to implement and utilize criterion-referenced instruction. The system was carefully designed and highly individualized, with the results of the experiences of persons measurable at each step of the way through use of a definitive course map.

2. Follow-up activities were excellent. Methods were included in the project which were used to assess the degree of utilization and implementation of criterion-referenced instruction by participating instructional personnel.

3. A thorough analysis was made of the effect of the pilot projects using criterion-referenced instruction on the students. The results of the analysis were convincing and provided considerable support for broader use of criterion-referenced instruction in vocational-technical programs in Utah.

Weaknesses of the Project

Weaknesses of the Utah Project--Phase I:

A comprehensive effort should have been made in Phase I to prepare supervisors and administrators to support and understand what was involved in introducing Air Force materials and criterion-referenced instruction into vocational-technical programs in the public schools. Support and understanding may have resulted in a change of role for administrators and supervisors in the development and implementation of the Phase I goals.

Weaknesses of the Utah Project--Phase II:

1. Upgrading and revision of the materials used by the Air Force which were applicable to the civilian vocational-technical programs required continuous input from the Air Force and, probably, long-term funding from the U. S. Office of Education.

2. The technology for the system of developing and implementing Air Force instructional materials was needed as much as the actual materials in vocational-technical education. The infusion of the Instructional Systems Design concept used by the Air Force may have produced long-range improvements and benefits which could not be accomplished by a sharing of materials only.

Weaknesses of the Utah Project--Phase III:

1. The project relied on continued funding from the U. S. Office of Education. Little planning was done to shift the responsibility gradually to states and agencies interested in the results of Phases I, II, and III.

2. As a result of loss of U.S.O.E. funding, the Aerospace Education Foundation packaged instructional programs and offered the materials for sale in order to keep the concepts and project findings going forward. An unfortunate situation, depending on "soft money" for project continuation, resulted in an overemphasis on products rather than process technology. The major problem of implementing criterion-referenced instruction was identified as the major obstacle in Phase III of the project. The successful implementation was a "people-centered" concept which required rigorous preparation of personnel and significant

philosophical changes concerning scheduling of student time, movement from a norm-referenced instructional environment to a criterion-referenced instructional environment, new methods of classroom management, and changes from the A, B, C, D, F syndrome to a competency grading situation based on the student meeting required levels of performance.

3. The U. S. Office of Education was less than efficient in the dissemination of the results of the Utah Project. More evaluation of the results of the Utah Project should have been conducted, and the results should have been disseminated to Divisions of Vocational-Technical Education across the country. A national conference on the results of the Aerospace Education Foundation experience could have served as a valuable follow-up activity to the Utah Project.

Project CAREER

Project CAREER is an experimental project of the Division of Occupational Education in the State of Massachursetts.[94] The primary purpose of the project is to collect performance objectives and/or behavioral objectives from various sources and to validate these objectives through a seven-stage model. Three local education agencies were selected as pilot-test sites for the various activities of Project

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[94]Clifford W. Easton, A paper entitled "Project CAREER: A Dynamic Alternative to Curriculum Development" presented to a Conference, "The Educational Consortia: An Effort Toward Accountability," sponsored by the Southern Association of Colleges and Schools and the Florida Department of Education, Atlanta, Georgia, April 3-5, 1973.

CAREER.[95] The project was developed to operate over a three-year period but has been extended in scope and duration. The project utilizes electronic data processing to support the analysis and retrieval of each objective.

Description of the Project

The project personnel developed a structural model[96] consisting of seven major activities designed to accomplish the purposes of the project. The seven major activities are:

1. Collection of Performance Objectives and/or Behavioral Objectives: The project began a comprehensive collection of performance and/or behavioral objectives in occupational education from any source that would cooperate with the project. The Educational Testing Service of Princeton, New Jersey, conducted a national search for Project CAREER and provided most of the objectives used in the project. Other sources were identified, and objectives were collected by the project staff.

2. Conversion Process: The conversion process was a systematic way of upgrading test items, task statements, and poorly prepared behavioral objectives into performance objectives of acceptable quality. Training in this process was provided to the Project's secondary teachers within the pilot schools and cooperating agencies. This enabled teachers to develop an immediate bank of performance objectives relevant to their own instructional areas. Because of the large number of objectives

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[95] Ibid., p. 6.

[96] Graphic illustrations, narrative descriptions, and computer printouts were furnished the researcher during the on-site visit to Project CAREER on April 10, 1973.

processed, a staff of volunteer workers and personnel from cooperating educational agencies was selected and trained to assist in this task.[97]

3. First Validation Process: The first validation process was an attempt to evaluate and upgrade the quality of the objectives as they pertained to specific occupations. After a preliminary screening and conversion process, all objectives were submitted to teams of industrial personnel for validation. The teams examined each objective and determined whether the implied learner performance was correctly stated. If it was, they returned it for submission into the data bank; if not, they made whatever editorial alterations were necessary to render the objective acceptable within the occupations. If extensive alterations were made on any objectives, they were sent to the appropriate participating instructional staff member from one of the pilot schools for conversion into a final form of acceptable quality.[98]

4. Four-Column Process: The four-column process was developed, by an interdisciplinary team of instructors and subject matter specialists, who organized actual course content relative to the objectives after the validation process. For each high quality, well-stated objective, members of the team listed the prerequisite learnings, component tasks, environment, and concepts, the latter of which was related to, but not necessary for, the performance of the listed objective. The development of the four-columns provided the essentials for a lesson plan. The columns could be utilized for preassessment, lesson

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[97] Easton, op. cit., p. 4.

[98] Ibid.

organization, and the development of an interdisciplinary approach to education.[99]

5. Second Validation: The second validation consisted of a review by persons from business and industry concerning the appropriateness of the objectives for current job performance. Small committees were used to accomplish this validation.

6. Handicapped Applicability Determination: Special committees which understood learning handicaps reviewed the objectives and rated the attainment potential of the objectives and their stated performance in terms of the different groups of handicapped persons. Information collected was computerized and made accessible through the use of a specially designed coding system.

7. Third Validation: The third validation consisted of a commonality review by committees of teachers and content specialists for the purpose of determining commonality of objectives in closely related areas of training. An example provided on the functional model cited Radiological Technologist as the broad area of training with common objectives applicable to Health Physicist, Radiation Monitor, and Dark Room Attendant. The basic concept of this activity was the identification of common objectives which could be offered in a core course used for exploratory programs, pre-vocational programs, and other related instruction.

In the project's planning stages, there was a guidance component which would be based upon the data in the computer bank of objectives.

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[99] Ibid., pp. 5-6.

No detailed information was available on this portion of the project during the on-site visit or in the latest material furnished by Project CAREER.

Strengths of the Project

The discussion of project strengths is limited by the fact that much work is still in the developmental and conceptual stages. Some work has been accomplished on each of the major activities; but as of the date of the on-site visit, no involvement of teachers in the field using the materials had occurred. In view of this, the major strengths are based upon the work accomplished as of April 10, 1973. Efforts have been made to obtain additional information on progress since that date, but no information has been made available.

1. The conceptual base of the model used by Project CAREER appears to have some potential for affecting improved articulation between levels of instruction. The possibility exists for the approach suggested by Project CAREER to maximize the dichotomy which exists between levels of vocational-technical education.

2. The design of computer programs to assist in refining, researching, and retrieving objectives has potential for improving the management aspects of curriculum development.

3. The identification of performance objectives attainable by handicapped learners offers potential for planning regular programs to provide for the special needs of these students.

4. The commonality review of objectives by teachers in related instructional programs has potential for improving and focusing the

pre-vocational, industrial arts, and career education programs on common objectives.

Weaknesses of the Project

The project is new and has some weaknesses:

1. The collection of objectives from any source and the logistics of analyzing, reviewing, coding, and processing such a large number has caused considerable delay in the project's attainment of its goals.[100] An alternative activity using committees of teachers to review and screen the materials earlier may have resulted in less of a "log jamming" problem.

2. The criteria used to determine the quality of the objectives did not include a comprehensive task analysis of the occupations to serve as further assurance that what is taught is what is needed on the job. The Educational Testing Service and the Instructional System Design (ISD) used by the U. S. Air Force focus on this step as the most valid and necessary foundation for determining the objectives of occupational training programs. (A discussion of the ETS approach and the Air Force ISD approach is included later in this section of the report.)

Further statements of weaknesses of the project would be unwarranted because of the relative newness of the project and the scope of the goals of the project.

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[100]Based upon personal interviews of project personnel during on-site visit, April 10, 1973.

Educational Testing Service Project

In this project, behavioral and performance objectives for use in the development of tests for screening and selecting prospective patrolmen were developed by ETS, Princeton, New Jersey, for the Philadelphia Police Department.[101] Major thrusts of the ETS model were intensive interviewing coupled with actual observation of policemen at work. In addition, surveys of patrolmen were conducted to obtain certain types of information regarding conditions under which patrolmen function and standards which indicate adequate performance of tasks.

Description of the Project

Interviewing Process: The project workers conducted extensive interviews of policemen--officers and patrolmen--at various levels in the police department. An interviewer's handbook guided interviewers through a systematic collection of information about job specifications, how to prepare job specifications, methods of observing duties on the job, and the component tasks making up the duty. Interview results were divided into four areas: (1) physical activity, (2) responsibility, (3) job knowledge, and (4) mental application. Information was collected concerning the tools, machines, and equipment which were operated as a part of the job.

Survey of Patrolmen: Upon completion of extensive interviewing, a checklist of performance objectives was developed which included

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[101] "Checklist of Behavioral Objectives for Policemen, City of Philadelphia" (Princeton: Educational Testing Service, November, 1972), p. 3.

background information concerning rank, ethnic background, current assignment, length of patrolmen experience, and total length of service as a policeman. The performance objectives were divided into eight broad duty areas. The patrolmen were asked to rate each objective in terms of frequency of performance, importance, discrimination, and entry level. The four ratings,[102] which included a numerical rating scale, were defined as follows:

> For each performance you are to indicate the frequency with which it is performed, its importance to acceptable job performance, the degree to which differences in the performance of this activity discriminate between officers who perform well and those who do not, and the extent of the ability required at entry into the position. The following codes are to be used in providing this information:
>
> FREQUENCY
>
> How often is this task performed on the job:
>
> (0) Not performed
> (1) Performed less than once a month but at least once per quarter
> (2) Performed less than once a week but at least once a month
> (3) Performed less than once per tour but at least once per week
> (4) Performed at least once during each tour of duty
>
> IMPORTANCE
>
> How important is this activity to acceptable job performance?
>
> (0) Not applicable because not performed
> (1) Of little or no importance
> (2) Moderately important
> (3) Very important
> (4) Of greatest importance
>
> DISCRIMINABILITY
>
> To what extent do differences in performance of this task relate to differences in officers' effectiveness?

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[102] Ibid., p. 2.

(0) Not applicable because not performed
(1) High and low performers work at about the same level on this task
(2) There are differences among officers but they do not seem to affect performance
(3) High performers seem to perform this task better
(4) High performers are clearly superior to low performers on this task

ENTRY EXTENT

To what extent is ability to perform this task necessary at entry into the academy?

(0) Not applicable because not performed
(1) Not important--is learned in the academy
(2) Desirable but not essential
(3) Some degree is essential
(4) Full competence is essential

Upon the completion and collection of the data from the survey, ETS developed performance objectives for patrolmen and accompanying tests to be used for the achievement of the purposes of the project.

Strengths of the Project

1. The extensive interviewing of patrolmen and officers in conjunction with structured observation periods provided detailed and valid information upon which to base the checklist survey.

2. The checklist survey was designed in a clear and simple format yet collected considerable amounts of data.

3. The rating scales used were clear and objective, yet they permitted flexibility for the rater.

Weaknesses of the Project

1. The major weakness of the project was cost. Considerable effort and time were required by interviewers and other project personnel to develop the checklist.

2. A comprehensive state-or-the-art study of what had been accomplished in identifying the job descriptions and tasks of policemen might have saved time and money during the interviewing and checklist development stages of the project.

Air Force Instructional Systems Development Model

The total model used by the U. S. Air Force is explained in a manual consisting of 410 pages of detailed explanation.[103] For purposes of this study, comments were limited to an analysis of the ISD Model. All information presented in this section of the report was the result of two on-site visits by the researcher to the Military Training Center at Lackland Air Force Base, Texas,[104] and an analysis of the Air Force ISD Model.

Description of the Air Force ISD Model

Figure 1, the U. S. Air Force Instructional Systems Development Model contains five major categories or divisions composed of several components.[105]

Analyze System Requirements: Step 1 of the model requires the collection of as much information as possible concerning any performance of a task by a human to accomplish a job or operation. The completion

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[103] Instructional Systems Materials Development (Lackland Air Force Base, Texas: Air Force Military Training Center, July, 1973).

[104] On-site visits were made to the Air Force Military Training Center, Lackland Air Force Base, Texas, on March 15, 1973, and May 14, 1973.

[105] Instructional Systems Materials Development, p. 2.

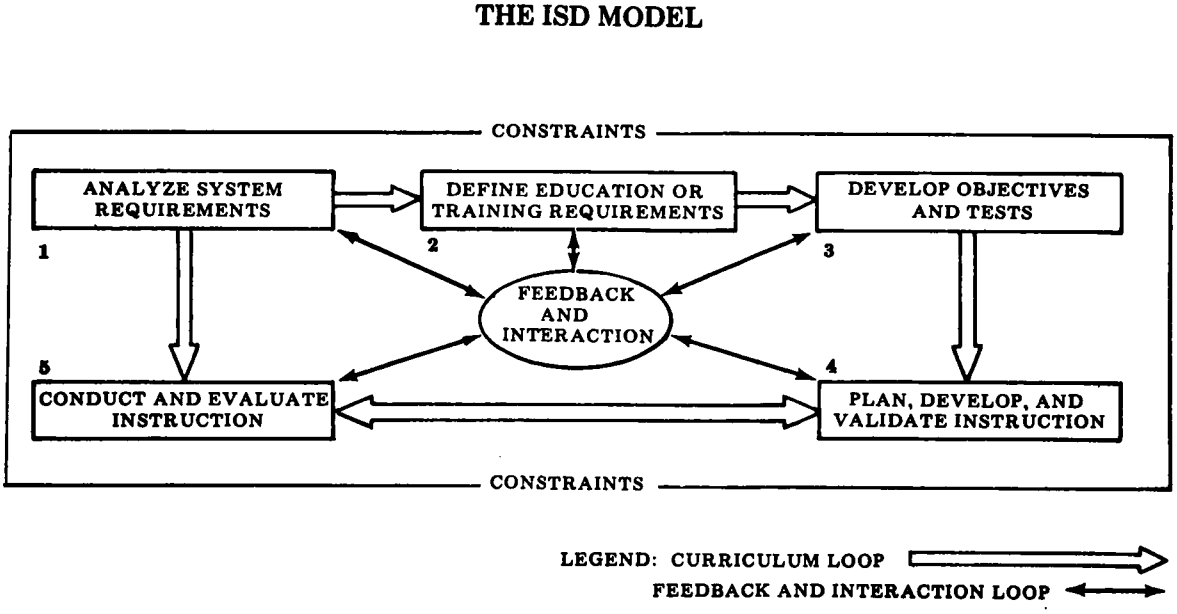

FIGURE 1. U. S. Air Force Instructional Systems Development Model.

of this step provides training designers with information in terms of task inventories, resources, environment or conditions of performance, or, in short, the job performance requirements.[106] The operational aspects of the job performance requirements procedure provide information on performance levels of tasks, equipment involved, frequency of performance, criticality, and percent of personnel performing the tasks.

Define Education and Training Requirements: Step 2 represents a major decision point for determining instructional content.[107] After completing the first step, instructional strategy is developed to satisfy the job requirements research by several methods and combination of methods such as formal school courses, new or existing courses, formal and informal on-the-job training, civilian training and experience, and selective personnel assignment. Some of the factors and constraints which influence decisions concerning the method of providing training to personnel are availability of time, qualified instructors, equipment and facilities, criticality and learning difficulty of the task, capability of the students, and the number to be trained.[108]

Develop Objectives and Tests: Learning objectives are developed based upon the detailed task analysis accomplished in step 1 and the training strategy selected in step 2 which becomes a part of a training standard. The Air Force training standard contains the analysis of training tasks and subject knowledge necessary to provide proper limits of instruction. Each objective describes a job-related performance in

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[106] Ibid.

[107] Ibid., p. 7.

[108] Ibid., p. 8.

terms of the behavior, standards, and conditions under which the student is to perform. Because objectives are derived from the task analysis of the job, only essential and relevant information is included. All objectives are then requisite to the job.[109] For each objective a test must be constructed to ensure that the students meet the objectives.[110]

Plan, Develop, and Validate Instruction: This step includes the selection of the most effective teaching media, the proper sequencing of teaching-learning activities, and the identification of resources.[111] The preparation of facilities, discussion, lectures, films, filmstrips, tapes, slides, performance projects, television assistance, and other materials must be developed, organized, and planned during this step.

Air Force courses are validated through three phases: (1) individual student tryout, (2) small group tryout, and (3) operational tryout.[112] Revisions are required throughout the duration of a course or until the desired validity has been obtained.

Conduct and Evaluate Instruction: This final step is the most important in terms of the continuing success of an instructional system. Despite the constant efforts of everyone involved in the design, a newly implemented system seldom attains all of its stated objectives. Continued improvement or redesign is a part of the developmental process.

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[109] Ibid., p. 10

[110] Ibid.

[111] Ibid., p. 11

[112] Ibid.

Training is primarily evaluated in terms of student attainment or nonattainment of the learning objectives--a method that provides the most direct identification of training problems. Necessary corrective actions may include changes in lesson plans, sequence, time allocations, or instructional methods. The adjustment of resources such as overall training time, equipment, or facilities may also be required. In addition, the need for refining, deleting, or establishing new learning objectives may be discovered. Therefore, the evaluation processes must be applied carefully to every phase of an instructional system if training efficiency is to be maintained. For this reason, training evaluation includes a course review and the evaluation of trainees in the field.[113]

Strengths of the ISD Model

1. The occupational analysis research system used by the Air Force appears to be the most important strength of the system. Detailed investigation of tasks performed, conditions under which they are performed, and acceptable standards of performance have their basis in the Air Force job and classification structure.

2. Media development and alternative educational delivery systems are strong points which support the classroom activities of instructional personnel.

3. Reasonable control over the selection of persons to be trained, coupled with outstanding facilities and equipment, provide excellent conditions for learning to occur.

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[113] Ibid., p. 12.

4. The selection and preparation of instructors from the ranks of the journeyman-level technicians in the Air Force ensure the technical quality of the instructional staff.

5. Teacher/instructor training programs are designed to prepare the journeyman technicians in a relatively short period of time to become efficient and effective instructors.

6. Many aspects of the ISD system are readily convertible for use in the civilian sector, though some are not without extensive financial commitment.

Weaknesses of the ISD Model

1. A need exists for more input from the journeyman-level technician concerning the technical content and procedures used in the training programs. The ISD provides for limited feedback from the job environment but not as much as could be achieved. The most apparent weakness exists in obtaining information concerning the conditions under which workers perform any given task.

2. The system (ISD) operates within a closely controlled environment where job classifications, content, and context can be reasonably easy to change. Instructional planning can react more quickly to changes in the job because of the controlled conditions of the military community.

3. The cost of the implementation of the Air Force approach would be a heavy burden on most public education systems, not merely in terms of dollars but in providing the proper philosophical conditions to permit the implementation.

Florida Model

Florida has been one of the most active states in the movement toward increased accountability in public education programs. The Legislature of Florida was among the first to enact educational accountability laws.

Description of the Florida Model

The Florida Model was designed to produce catalogs of performance objectives and criterion-referenced measures in occupational education. Four projects were funded, each using the same project control and monitoring process. The projects--Ornamental Horticulture, Typewriting Communications, Employability Skills, and Automotive Mechanics--were developed over a three-year period and represented an investment of just under $200,000.[114] The procedure used by Florida in the development of the projects was as follows:

Request for Proposals:[115] This document identified ideas which needed research and development and served as a means of soliciting proposals from organizations which had the ability, personnel, and technical competence to complete the project. The document provided the philosophical, fiscal, and administrative strategies to ensure successful

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[114] Based upon a personal interview with Kenneth Eaddy and Roy Giehls, Department of Education, Division of Vocational Education, Vocational Education and Research Section, Tallahassee, Florida, December 21, 1972.

[115] A Report of Procedures Used to Develop Performance Objectives and Criterion Measures (Atlanta: Southern Association of Colleges and Schools, Commission on Occupational Education Institutions, and the Florida Research and Development Program, January, 1973), p. 17. (Grant No. SDE 730-073.)

completion of a project. The Request for Proposals outlined the suggested format of the proposal and included topics which fully explained the management procedures to be used in the project. The Request for Proposals included guidelines for project format, methods of evaluation, plans for contract awards, and general contractual provisions.

Development of Agreements:[115] Upon approval of the proposal, the successful proposer developed with the Florida Educational Research and Development Program a Memorandum of Agreement. This set forth the obligation of each party and established reporting and product delivery dates. Special conditions were also explained in the Memorandum of Agreement. This Memorandum of Agreement became the legal binder of the two parties to the conditions set forth in the proposal.

Reporting Procedures:[116] Periods of reporting were a part of all Memoranda of Agreement and were mutually established by the successful proposal writer and the Florida Educational Research and Development Program. Reporting requirements were established on specific dates and at various intervals through the life of the project. Reports took the form of progress reports, rough drafts of the product, or the finished product. Reports and/or drafts of the product were coordinated directly with payment schedules. When the specified report or product was delivered, under conditions of the Memorandum of Agreement a pre-determined amount of money was paid.

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[115] Ibid., p. 18.

[116] Ibid., p. 19.

Project Management:[117] A project monitor was assigned to each project upon the development and approval of the Memorandum of Agreement. This person(s) interpreted the contract to the project personnel and served as a reporter to the Florida Educational Research and Development Program regarding the progress of the project. In projects which involved the production of objectives and test exercises, the project monitor was a subject-matter specialist and had the responsibility for approving or disapproving the product output with respect to content. The guide for monitoring was the "Schedule of Events" required of the contractor. The project monitor also made recommendations for payment as the necessary reports and/or products were delivered and accepted.

Methods Used to Develop Performance Objectives:[118] Detailed procedures for developing performance objectives were provided to each contractor by the Florida Research and Development Program as follows:

1. State-of-the-Art Study--A comprehensive review of research sources was made to determine the amount of work that had been accomplished in a given area and what implications the accomplishments had for the project under development.

2. Domain Charting for the Occupational Area Under Development--This component set the research limits and the specific structure in terms of identifiable job titles to be covered by a catalog of performance objectives.

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[117] Ibid., pp. 18-19.

[118] Ibid., pp. 20-24.

3. Development of Pre-Objectives--The pre-objectives were defined as preliminary performance objectives which provided a sequence leading to a terminal performance objective.

4. Use of Content Specialists--Content specialists were employed as writers because of their competence and expertise in a domain area. Frequently, the specialists were trained by technical coordinators in the Department of Education to function in their roles.

5. Use of General Advisory Committees--A general advisory committee assisted in guiding the research, providing advice and counsel, and serving as a feedback group on matters concerning project approaches.

6. Use of Craft Advisory Committees--The craft advisory committee served as a chief review committee for all objectives, criterion measures, and other technical input obtained by the project staff. The craft committee assisted in conducting surveys establishing contacts with key persons in business and industry, and as a final technical review committee for the content of the catalogs.

7. Cataloging Performance Objectives and Criterion-Referenced Measures--Each catalog was developed and coded in a manner which provided accessibility to the objectives and measures. Guidelines were set forth for formating by the Research and Evaluation Section of the Division of Vocational-Technical and Adult Education.

8. Field Testing--The field testing included use of test consultants, identification of test sites, types of students to be used in field tests, methods of testing, involvement of teachers and supervisors, collection of student information on data sheets, and a report on the total field test results.

Detailed procedures for the development of criterion test items, validation procedures, plans for dissemination, in-service training of personnel, and procedures for updating and revising catalogs were included in the methods used by the Florida projects.[119]

Strengths of the Florida Model

1. The coding system used in the Automotive Mechanics project was considered a major strength. The coding system provided a means of retrieval of any specific objective within a course: within a unit area and by individual lesson. Necessary pre-objective performance objectives and criterion-referenced measures may be located by a teacher and organized to suit the particular instructional needs of the student.

2. Domain charts developed by the Ornamental Horticulture project and the Automotive project were excellent and involved considerable input from craft advisory committee members and employers.

3. Project administration, delivery dates, and other monitoring controls appeared to be rigid; but their use resulted in the punctual meeting of deadline dates for delivery of the reports and products.

Weaknesses of the Florida Model

1. The dissemination and in-service portions of the projects were relatively weak when compared to the other aspects of the procedure.

2. Provisions for updating and revising the catalogs were almost non-existent. This situation has improved since changes were made as

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[119] Ibid., pp. 25-29.

a result of the report made by the Southern Association of Colleges and Schools during its review of the Florida Model.

3. Uniform methods were not used to conduct thorough task analysis of the jobs included in the catalogs of objectives. Most of the information concerning the performances stated in the objectives was obtained from a small craft committee, a few interviews with employers, or from instructors serving as writers for the projects.

Chapter IV provides footnoted sources of the sub-activities in the Phase I a Priori Activity Model. The specific contribution of the related literature and the study of selected projects were identified during the narrative presentations in Chapter IV.

Michigan Model

The State of Michigan is considered to be the most progressive of the states in exploring and applying accountability procedures.[120] Michigan's model for developing performance objectives in occupational and career education is basically the same as that used in other programs of education in the state.

Description of the Michigan Model

Michigan has a six-step accountability model which guides all of education in the state toward the development of specific goals and

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[120] Ernest R. House, Wendell Rivers, and Daniel L. Stuffelbeam, "An Assessment of the Michigan Accountability System," Phi Delta Kappan, LV (June, 1974), 663.

objectives. The elements of the accountability model are:[121] (1) involving persons from throughout the state in defining common goals as a useful way of focusing communications about educational accountability, (2) translating common goals into objectives, thus providing a broad base of important variables for needs assessment in Michigan schools, (3) assessing needs in relation to objectives derived from the common goals, (4) testing alternative delivery systems to assist the state in developing a research base for schools in the adoption of innovative strategies, (5) fostering the development and use of local evaluation capacity, and (6) using feedback from the accountability system to guide state and local educational policy.

From this rather broad and general base, the Division of Vocational Education and Career Development Service developed a comprehensive set of guidelines for the Performance Objectives Project.[122] The guidelines involve considerable integration of the state department and local education agencies. Reporting requirements, sources of funding, identification of field consultation services, and identification of contact persons in the Division of Vocational Education and Career Development Services were explained and presented in detail. A two-year plan in the guidelines included flow charts, time schedules, activity outlines, narrative descriptions, and various procedural steps. The flowchart for the two-year plan of performance objectives development

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[121] Ibid., p. 664.

[122] Phillip T. Bailey, David H. Bland, and Dan Brown, Guidelines for the Performance Objectives Project (Lansing: Michigan Department of Education, September, 1972).

consisted of 18 specific activities with target dates for completion.[123] Each of the 18 activities was explained with details including the level of involvement (State Department, LEA, etc.) and, in some cases, the classification of persons involved (principal, teacher, subject matter expert, etc.). Special Issues Committees were organized to deal with special problems experienced by personnel in the LEA's after their initial in-service training. Several publications assist in the explanation of the accountability model in Michigan and in the developing of performance objectives.

Strengths of the Model

1. Involvement of large numbers of personnel was considered a strong point of the Michigan model. The involvement was predominantly at the local level with the formation of a triad system to enhance communications.

2. The model stressed the use of specialists as consultants and as members of ad hoc committees.

3. Descriptions and narrative information provided in the "Guidelines for the Performance Objectives Development Project" were clear, concise, and definitive. Lines of communication appear to be clear and well established.

4. The accountability model and the performance objectives project have top level administrative support.

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[123] Ibid., p. 13.

Weaknesses of the Model

1. Little evidence existed of a sound research base for the development of performance objectives. No state-of-the-art studies were conducted to take advantage of work accomplished by others outside the State of Michigan.

2. A thorough system of task analysis was not evident in the guidelines or the other literature furnished for study. Defining what should be taught in a vocational education program should include a strong process of task analysis.[124]

VII. THE DELPHI TECHNIQUE

Often the use of committees, panels, or other groups is not completely adequate for the purpose of problem solving. Experiments by social psychologists have shown that the traditional method of presenting issues to a number of experts and allowing the majority recommendation to rule is not the most desirable method of solving a problem.[125] In the last several decades, education has borrowed many quantitative research tools from the military as aids to decisionmaking in complex issues. With assistance of computer hardware, these tools have given momentum to the scientific decisionmaking process and have provided the decision maker with something more tangible than intuition or judgment upon which to base decisions.[126] Often, however, quantitative tools

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[124]Butler, op. cit., p. 78.

[125]E. S. Quade, Cost Effectiveness: Some Trends in Analysis (Santa Monica: Rand Corporation, March, 1967), p. 35.

are not applicable to the problem at hand, as is quite often the case with political or social issues. The Delphi Technique preserves the advantages of the quantitative models while, at the same time, uses the qualitative variable of expert judgment. The Delphi Technique allows an inter-disciplinary approach which is necessary in political and social investigations. This transfer of operations research methodology to the educational arena offers possibilities for social policy-making and focus. It is much like the breakthrough in the physical sciences which led to the development of the atomic bomb.[127]

The Delphi Technique can be defined as the systematic use of expert opinion with consensus determined through a series of quantified question-response sequences.[128]

Development of the Delphi Technique

When the second World War was over, economists predicted a severe recession in the American economy because of the end of the war economy and the large influx of job seekers returning from the war. However, this recession did not occur; instead there was a period of rapid economic growth. Forecasters began searching for a more reliable predictive device. Until this early post-war period, little attention had been given to discovering better ways to utilize expert opinions, which

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[126]David W. Miller and Martin K. Starr, Executive Decisions and Operations Research (Englewood Cliffs: Prentice-Hall, Inc., 1969), p. 49.

[127]Olaf Helmer, The Future of Science (Santa Monica: Rand Corporation, May, 1967), p. 7.

[128]Quade, op. cit., p. 9.

are basic to all analysis. In 1948, the first experiment with the Delphi Technique was carried out by Olaf Helmer of the Rand Corporation; and although the results showed promise, the method was seriously criticized.[129]

The Working Structure of the Delphi Technique

The Delphi Technique attempts to take individual opinions, compile a meaningful group response, and arrive at a forecase that is better than that which would be possible through a committee or panel effort. Committees have suffered from an inability to arrive at an accurate position for many reasons, such as the influence of a dominant individual, irrelevant information clouding the issue, unwillingness to abandon publicly expressed opinions, and group pressure to achieve a compromise decision.[130] These restrictions are relieved considerably by the Delphi Technique.

The Delphi Technique employs a series of questionnaires, thus eliminating the possibility that any one individual or small group would be able to control the direction of the group because of reputation, position, or speaking ability. Participants are polled separately, often by mail, and are asked to give their opinions about future developments in selected topics. Information from the instrument is then compiled and a second question-response is undertaken. A preliminary difference is that on this second round, each of the panelists is told

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[129] Ibid.

[130] Norman C. Dalkey, Delphi (Santa Monica: Rand Corporation, October, 1964), pp. 2-3.

how the rest of the group responded on the first round. This sometimes takes the form of a mode or mean response. Panelists are then asked to re-evaluate their own responses in light of the new information and to make any individual changes they feel are warranted. If an individual maintains a position outside the position specified, he is asked to state briefly why his answer should be higher or lower than the majority of the opinions. Then, the second set of data is collected, compiled, and fed back to the respondents. In succeeding rounds, the participants are asked to evaluate each of their responses; and if they deviate from the statistical measure selected, they are requested to justify the estimates. These justifications are summarized, fed back to the group, and counter-arguments are sought. Finally, the counter-arguments are collected and returned to the individual participants with a request for a final appraisal.

Effectiveness of the Delphi Technique

Upon completion of all probes, the ultimate range of possibilities should have been narrowed to encompass the true response. According to Dalkey, "For material where confirmation is possible, typical outcomes are that opinions tend to converge during the experiment, and more frequently than not the mode or mean response moves in the direction of the true answer."[131] Where confirmation is not possible, it has been shown that opinions have converged during the exercise.[132] Tests have

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[131] Ibid.

[132] Norman Dalkey and Olaf Helmer, "An Experimental Application of the Delphi Method to the Use of Experts," Management Science, IX (1963), 458.

been made where participants were asked to reassess their answers to questions where no feedback was provided and second round convergence has occurred, thus minimizing the possibility of existence of a desire to conform to the majority.[133] It appears that the opportunity to re-think an answer as well as other peoples' opinions is important in bringing estimates together.

There have been instances where no convergence toward a narrow range of values took place; opinions have tended to polarize around two distinct values, reflecting the emergence of two schools of thought.[134] In this case, the Delphi Technique serves to crystallize the reasoning process and helps to clarify and identify major alternatives, although, if carried further, it might finally help resolve the differences of opinion.[135] Results of several experiments conducted by the Rand Corporation confirm that group discussion achieves no advantage over methods employing statistical aggregation and, in most cases, group discussion leads to a degradation of group estimates.[136]

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[133]Dalkey, Delphi, op. cit., p. 5.

[134]Olaf Helmer, Systematic Use of Expert Opinions (Santa Monica: Rand Corporation, November, 1967), pp. 4-5.

[135]Olaf Helmer, The Use of the Delphi Technique in Problems of Educational Innovations (Santa Monica: Rand Corporation, 1967), pp. 3-4.

[136]Norman C. Dalkey, "The Delphi Method: An Experimental Study of Group Opinion" (Santa Monica: Rand Corporation, 1969), pp. 21-23.

Advantages of Delphi

The Delphi procedures possess many advantages in the solicitation and use of expert opinion as a basis for policy formulation that have been previously mentioned. Dalkey identified three distinct characteristics:[137]

1. Anonymity
2. Controlled feedback
3. Statistical "group response"

Anonymity is a device to reduce the effect of the socially dominant individual. Formal communication channels are maintained by the researcher, but the experts do not communicate directly with each other. Controlled feedback reduces confusing or external information which might cloud the real issue. This information takes the form of statistical central tendency measures as well as non-emotional arguments and counter-arguments for deviant positions. It might be felt that this feedback produces some pressure to conform to the norm, but such is not the case in previous controlled experiments. Members are able to reassess their original estimates with access to information that might have been overlooked originally. Statistical group response allows representation of the group opinion while making no overt effort to arrive at unanimity among the respondents. Normally, a spread of opinions on the final round is typical of the procedure. Recognition that a range of answers, as opposed to a point estimate, is the norm further reduces group pressure for conformity. Statistical group measures also minimize time inputs by panel members, which is different from

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[137]Dalkey, Delphi, op. cit., p. 3.

conferences or panel discussions, making the technique attractive to those experts whose limited time is almost totally allocated. Most important is the knowledge that the opinion of every member of the group is represented in the final response.

Limitations of Delphi Procedures

Variations and modifications of the basic technique to apply to a variety of specific circumstances appear to be endless, yet the role of Delphi procedures within the total body of forecasting techniques has not been established.[138] Whether Delphi should serve as an input generating device for other formal forecasting methods or as the formal predictive tool cannot be determined from available data. In itself, this peculiar characteristic does not limit the procedure as a effective tool; but it certainly restricts the range of employment in which the Delphi might be utilized.

Unlike the more formal predictive devices which have certain prescribed procedures and, in many cases, pre-determined parameters, the Delphi Technique can be used or misused, depending almost entirely on the standards of the individual or group conducting the exercise.[139] Other formal procedures describe bounds and therefore limit results. By not being rigidly defined, the Delphi permits a broader range of possible alternatives.

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[138] Dalkey, Delphi, op. cit., p. 8.

[139] Dalkey, "Experimental Study of Group Opinion," op. cit., p. 17.

The primary limitation of the Delphi Technique is that it is cumbersome. Several weeks may elapse before the questionnaires are returned, and because of the time lapse, the respondent may have difficulty reproducing his earlier reasoning. The quantity of material to be processed by the participants is considerable, and when coupled with the time frame, further compounds the reasoning process is succeeding rounds. In fact, project directors have their own problems with digesting and collating a formidable amount of material.[140] In the Delphi Technique's weaknesses may lie one of its basic strengths.

Objections to Delphi

Objections have been raised over the methodology of the Delphi procedures. Unless altered, the usual procedure is for the panelist to develop ideas in the first stage to concentrate on in the study. Many ideas are often generated, so that those most similar are bunched to facilitate processing later in the procedure. Grouping of ideas in this manner has been challenged as making the topics so vague as to be almost meaningless.[141]

Concern has also been raised about the composition of the panel of experts. The question is asked whether the selected panelists could represent more than a few independent opinions. Blackwell believes that scholars in any discipline are in such close contact that they tend to develop an "intellectual party line." He feels that any Delphi panel

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[140] Quade, op. cit., p. 16.

[141] George Boehm, "Futurism," Think, July-August, 1970, p. 21.

should include mavericks and that their opinions should be heeded if the panel is to be objective.[142]

After consideration of the strengths and weaknesses of the Delphi Technique the decision was made to use the procedure for achieving the objectives and purposes of the study. The major strengths of the Delphi Technique; i.e., anonymity, controlled feedback, and statistical group responses were considered more crucial for the purpose of the study than the apparent weaknesses of the approach.

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[142] Ibid.

CHAPTER III

METHODOLOGY

The study was organized and conducted in two phases. Phase I consisted of six purposes, and Phase II consisted of three purposes. The primary focus of the study was to obtain responses, feedback, and convergence of opinion from a jury of experts for the development of an activity model for V-TECS.

The major purposes of Phase I of the study were to:

1. Develop an a priori activity model to form the basis for Delphi Probe I and subsequent probes;

2. Develop an a priori sequencing chart of model activities and sub-activities for use with Delphi Probe I and subsequent probes;

3. Obtain additional activities and sub-activities based upon recommendations of the jury of experts during the administrations of Delphi Probe I;

4. Eliminate unimportant activities and sub-activities as determined by responses of the jury of experts and by other criteria which are enumerated later in this section of the report;

5. Obtain recommendations from the jury of experts on the sequencing of model activities; and

6. Determine the activities and sub-activities, based upon responses of the jury of experts, to be included in Delphi Probe II and subsequent probes.

The major purposes in conducting Phase II of the study were to:

1. Obtain convergence of opinion of the jurors concerning the relative importance of each sub-activity under realistic and idealistic conditions;

2. Apply the criteria for exclusion or inclusion of activities and sub-activities in the Phase II Activity Model; and

3. Analyze the data resulting from Delphi probes used in the study to form the basis for the recommended activity model presented in Chapter VI of the study.

The attainment of the purposes was accomplished through 12 major tasks of the study which are enumerated on the following pages. Some major tasks are explained in detail in the text of this section of the report and others are supported by an appendix to the report. The major tasks of the study, which occurred during the time periods shown below, are illustrated in Figure 2.

1. Preliminary review of related literature (November 12, 1972 - March 9, 1973).

2. On-site visits to selected projects (December 21, 1972 - June 12, 1973).

3. Determination of projects to be reviewed for the study (January 16, 1973 - June 26, 1973).

4. Updating and writing the review of related literature (June 1, 1973 - September 10, 1973; March 10, 1974 - April 26, 1974).

5. Determination of activities and sub-activities for developing the Phase I a Priori Activity Model (June 15, 1973 - September 13, 1973).

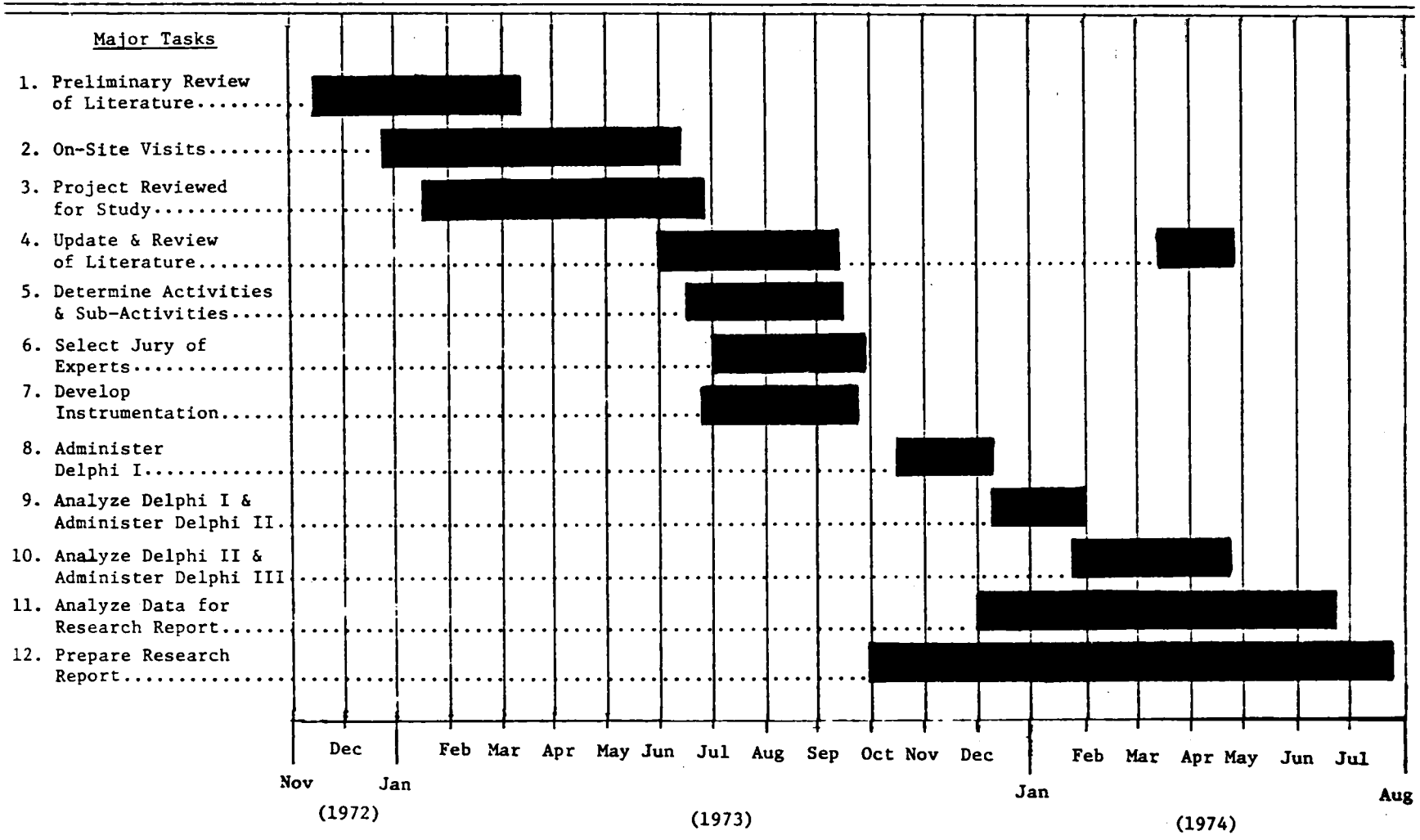

FIGURE 2. Chronological sequence of the major tasks of the study.

6. Selection of the jury of experts (July 1, 1973 - September 28, 1973).

7. Development of the initial instrumentation used for the study (June 23, 1973 - September 21, 1973).

8. Administration of Delphi Probe I (October 16, 1973 - December 26, 1973).

9. Analysis of Delphi Probe I and administration of Delphi Probe II (December 6, 1973 - February 1, 1974).

10. Analysis of Delphi Probe II and administration of Delphi Probe III (January 27, 1974 - April 26, 1974).

11. Analysis and preparation of data for the research report (December 1, 1973 - June 20, 1974).

12. Preparation and presentation of the research report (September 30, 1973 - July 18, 1974).

I. PHASE I OF THE STUDY

Preliminary Review of Related Literature

A preliminary review of related literature was conducted during a period beginning on November 13, 1972, and extending through March of 1973. During that period, books, periodicals, dissertations and dissertation abstracts, U. S. Office of Education project descriptions and reports, and other information available through computer-assisted searches of ERIC and the Vocational-Technical Education Clearinghouse at The Ohio State University were reviewed. The purposes of the review of literature were to:

1. Ascertain the state of the art of performance-based instruction, model development theory, criterion-referenced measures and their use, the Delphi Technique and its application, and the development and growth of educational consortia;

2. Provide research parameters for the activity model based on what had been accomplished by others; and

3. Aid the researcher in planning the details of the study.

On-Site Visits to Selected Projects Involved in Performance-Based Instruction

The development of the study was closely related to an effort by the Southern Association of Colleges and Schools, COEI, to form a multi-state consortium to produce catalogs of performance objectives and criterion-referenced measures for occupational education. As a result, the researcher conducted on-site visits and interviews of key project personnel who were involved in some aspects of performance-based instruction. The interviews were conducted to determine the following:

1. What was being accomplished by the projects;
2. How the accomplishments were being made; and
3. Which individuals associated with the projects had expertise and experience in performance-based instruction.

Appendix B of the report contains the names of project personnel interviewed, location of the interviews, and date of occurrence.

Determination of Projects to Be Studied

The next major procedural step involved obtaining the participation of projects and personnel who were developing, collecting, or otherwise involved in performance-based instruction in occupational education. During the on-site visits and the review of literature, nine projects were identified which appeared to be related to the development, collection, and dissemination of performance-based instructional objectives and materials. Personnel in nine projects were contacted by letter and/or telephone in order to obtain answers to the following three questions:

1. Does the project have a formal model or written procedural guide used to control and direct its activities?

2. Would personnel in the organization provide descriptive materials and participate in the research project being conducted?

3. Would materials, reports, and activities published by the project be available for study, review, and possible inclusion in the activity model being developed?

The organizations which agreed to participate in the study provided the basis for models and projects reviewed for the attainment of the objectives of the study. Letters are included in Appendix D.

Conducting and Writing the Review of Literature

This task focused on the synthesis of related literature which had a direct influence on the development of an activity model for V-TECS and the procedures used in the study. The writing of the review of literature which is included in Chapter II focused on information

which could support and rationalize the Phase I a Priori Activity Model. The synthesis of the related literature occurred during the period beginning in June, 1973, and ending in September, 1973. A computer-assisted search of the ERIC files and three manual updates of the computer search were used as a basis for updating the literature review.

On-site visits and personal interviews provided a source of current and germane information directly related to the research project. Examples of work accomplished, methods used, systems of control and management, and other related items were observed and/or collected for use during the study. James Straubel, Executive Director of the Aerospace Education Foundation, noted that the best sources of information on criterion-referenced instruction were available from actual on-going projects. Straubel made the following statement:

> The most obvious conclusion to draw from the information search is that though a fair amount of information exists about what teachers and administrators should be able to do to manage criterion-referenced courses, most of that information is as yet available only from those actively involved in that activity rather than from the literature. This is not too surprising since the advent of the completely criterion-referenced course is relatively recent and since not all those actively managing criterion-referenced courses feel a need to publish.[143]

Criteria for the Selection of Activities and Sub-Activities for the a Priori Phase I Activity Model

The criteria for determining activities and sub-activities were based upon a comprehensive review of the literature with emphasis upon

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[143] James H. Straubel, "Development of a Course for Training Vocational-Technical Educators on the Effective Use of Criterion-Referenced Materials" (Washington: Aerospace Education Foundation and U. S. Office of Education, 1972), p. 12. (Project No. OEC-0-70-4980-399.)

the projects studied and presented in Chapter II. The following criteria served as a guide for selecting the major activities and sub-activities included in the a Priori Phase I Activity Model:

1. The activity or sub-activity had been operationalized in one of the projects or models selected for review for the research study.

2. Activities and sub-activities involved interaction or participation of autonomous institutions or agencies.

3. Activities and sub-activities selected from the literature provided logical support or continuity to the model.

4. Activities and sub-activities had been preliminarily reviewed, revised, sequenced, and accepted by selected persons in occupational education. (The list of persons is included in Appendix C.)

Initial Sequencing of Activities

The arrangement of the activities for the Phase I A Priori Model for use in developing Delphi Probe I was accomplished by determining the logical occurrence of sub-activities within the major activities. A list of critical activities and sub-activities was developed and arranged on cards. The primary consideration for arrangement of the activities was determined by considering each sub-activity and its likelihood of chronological occurrence. The jury of experts was utilized to obtain the final sequencing of the activities from responses collected on Delphi Probe I and Delphi Probe II.

Selection of the Jury of Experts

The selection of the jury of experts resulted from the review of related literature and from the on-site visitation phase of the project.

Forty persons were identified who possessed specific expertise which was considered essential to the further development, refinement, and validation of the Phase I a Priori Activity Mode. The forty prospective members represented expertise in educational research, evaluation, curriculum development, personnel management, teacher education, systems development and model construction, and occupational analysis. Potential jury members were contacted concerning their participation in the study. The initial letters to the jurors are included in Appendix E, and a listing of the members of the jury of experts is included in Appendix F. Each jury member met two or more of the following criteria for selection:

1. Was identified by persons contacted during the on-site visitation phase of the project as leaders in a specific area of expertise.

2. Was familiar with and/or involved in performance-based instruction.

3. Was considered to have a position which directly related to the supervision of instructional personnel in vocational-technical education.

4. Was identified in the review of related literature as a decision maker and/or pacesetter in a specialized area of expertise related to the objectives of the study.

5. Was willing to participate in the study through its completion.

Instrumentation

The description of activities and sub-activities developed during the review of related literature and the study of seven selected projects was developed into an instrument used for administration of the subsequent Delphi probes. Certain changes were made to facilitate feedback and to encourage convergence of opinion. In view of these changes, each instrument and its response mechanisms are presented and explained independently.

Delphi Probe I was designed to:

1. Identify additional activities and/or sub-activities based upon the recommendation of two or more members of the jury of experts;

2. Preliminarily sequence initial activities and new activities identified by two or more members of the jury of experts; and

3. Obtain mode responses from the jury of experts for use in Delphi Probes II and III.

The administration of the three Delphi probes was managed by application of Roberts' Rules of Order.[144] For example, on the first probe, one jury member could make a recommended change (place a motion on the floor); but in order for the motion to be considered, a second jury member was required to make the same recommendation (the motion seconded). This rule was applied to recommendations for changes in the sequencing of activities and sub-activities and for the addition of new activities and sub-activities. On Delphi I, each juror was asked to

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[144] Henry M. Roberts and Rachel Vixmir, Roberts' Rules of Order (New York: Pyramid Books, 1971).

react to each sub-activity according to the following scale:

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

The scale is copyrighted property of the Educational Testing Service, Princeton, New Jersey. Permission was obtained by the researcher to adapt the scale for use in this research project. The letter granting permission to use the scale is included in Appendix G. The jurors were asked to respond to each of the sub-activities in terms of its relative importance. Values were assigned for each response category for "IS" and "SHOULD BE" as follows:

5 -- of extremely high importance

4 -- of high importance

3 -- of medium importance

2 -- of low importance

1 -- of no importance

The following definitions for "IS" and "SHOULD BE" were supplied in the instructions for Delphi Probe I:

IS -- The row of boxes following IS should be checked at the appropriate place which represents your opinion of the importance of the sub-activity under the constraints presently known to you. (This IS response will be considered your realistic estimation of the importance.)

SHOULD BE -- The row of boxes following SHOULD BE is to be checked at the appropriate place which represents your opinion of the importance of the sub-activity without consideration of constraints known to you. (This SHOULD BE response is considered your idealistic estimation of the importance.)

At the end of each of the twelve major activities, a space was provided for the jurors to recommend new sub-activities. The recommendations were collected using the following response mechanism:

Sub-activity I -- _____

(Add additional sub-activity(ies) you recommend. Attach additional pages or write on the back of the page if you desire to recommend more than one additional sub-activity.)

_____

_____

_____

_____

After completing the previous two responses, the jurors were asked to use an a priori sequence chart and respond to the sequencing or each of the twelve activities. The following mechanism was used to collect the juror's recommendations:

SEQUENCE RESPONSE (Complete during Step Two)

Activity III is ☐ properly ☐ improperly sequenced. If improperly sequenced, I recommend this Activity follow Activity ____.

The first Delphi probe was managed on an open meeting basis which allowed all recommendations to be considered if they met the previously stated conditions. A copy of the Delphi Probe I instrument is included as Appendix H of this report.

Delphi Probe II was designed for the following purposes:

1. To provide feedback to the jury of experts regarding the most frequently marked responses by sub-activity on Delphi Probe I.

2. To obtain new responses from each of the jurors who did not select the most frequently marked response on each sub-activity of Delphi Probe I.

3. To collect reasons for maintenance of responses which were contrary to the most frequently marked responses, either above or below the mode response.

4. To obtain a rating of importance on new sub-activities added to the Phase I a Priori Activity Model by the jurors during the Delphi Probe I administration.

5. To obtain additional responses concerning the sequencing of each activity.

The same response mechanisms used for Delphi I were used for Delphi Probe II to collect information from the jurors. One additional response mechanism was added for the purpose of collecting reasons for the maintenance of a response contrary to the most frequently marked response on Delphi I. The response mechanism used appeared after each of the sub-activities in the following form:

REASONS FOR MAINTAINING YOUR RESPONSE DECISION

_____

_____

_____

A copy of Delphi Probe II is included as Appendix I of the report.

II. PHASE II OF THE STUDY

Delphi Probe III

Delphi Probe III, the final probe of the jurors, had three specific purposes:

1. To provide feedback regarding dissenting responses in the form of reasons for maintaining minority points of view. (The reasons were collected from persons who maintained positions which were contrary to the most frequently marked responses on Delphi II.)

2. To obtain responses from the jurors using the same scales as were used for Delphi Probes I and II for the rating of relative importance of each sub-activity. (Responses were made by the jurors after consideration of the minority points of view which were provided to them as an attachment to Delphi Probe III. The most frequently marked response for each sub-activity was circled on Delphi Probe III as a point of reference for each jury member. No individual responses were furnished.)

3. To collect final comments which members of the jury considered necessary for additional refinement of the Phase II model.

The sequencing of activities was accomplished during the Delphi Probe II administration. A discussion of the findings and results of the sequencing procedure is included in Chapter V, Presentation and Discussion of Data, under the section headed "Instrumentation."

Instructions for response to Delphi III included a scale which was premarked by a circle indicating the most frequently marked response by the jurors during Delphi II. The scale appeared in the following form:

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	◯	☐	☐	☐
SHOULD BE	◯	☐	☐	☐	☐

An attachment was included with Delphi III which categorized all reasons for maintaining responses contrary to the most frequently marked responses on Delphi II. This attachment was organized and presented in Appendix J of this report.

Criteria Used for Administration of Delphi Probes I, II, and III

The Delphi probes were administered under guidelines furnished by Roberts' Rules of Order. Each Delphi probe was considered to be a type of meeting of the jury members. The specific rules were as follows:

Delphi Probe I was conducted under rules of an occasional meeting. The a priori development of activities and sub-activities considered as a recommendation to the jurors who agreed to participate in the development of the Phase I Model. During Delphi Probe I, a sub-activity must have received a simple majority (51 percent) of the responses of the jury above the rating of 3 (medium importance) on the relative importance scale for both the "IS" and "SHOULD BE" conditions. A new activity or sub-activity was added if recommended by two or more jurors. The first jury members was considered to have made the motion, and the second jury member was considered to have provided the second to the motion. The same rule was applied to recommendations for changes in the a priori sequencing of activities and sub-activities.

Delphi Probe II was also conducted under rules of an occasional meeting. Delphi II was conducted by the application of a two-thirds majority (67 percent) to the responses concerning relative importance. No activity or sub-activity was considered for inclusion on Delphi Probe III which did not receive a mean rating of 3 (medium importance) or higher by at least two-thirds of the jurors on both the "IS" and "SHOULD BE" conditions. The same majority support was applied to the sequencing of activities during Delphi Probe II. Minority points of view were collected during Delphi II from persons who maintained scale ratings either above or below the most frequently marked position of relative importance for both the "IS" and "SHOULD BE" condition.

Delphi Probe III was also conducted under rules of an occasional meeting by the application of the three-fourths (75 percent) majority. Minority points of view from Delphi II were provided to the jurors.

A sub-activity was included in the Phase II Model if, on Delphi III, three-fourths of the jurors rated (in terms of modes) the sub-activities' relative importance as 3 (of medium importance) or higher. Final comments were collected from the jurors concerning the activities included in Delphi III.

Methods Used to Analyze the Data

The data which resulted from the responses of the jurors were analyzed on the computer in the Computing Center of The University of Tennessee. Data were electronically processed by use of programs and routines available in the Statistical Package for the Social Sciences (SPSS).[145] Means, modes, variance, percentages, and reliability computations were made and are reported in Chapter V of the report. Some minor modifications were made in the SPSS system to allow computations and further groupings of response items. Modifications were made by programmers available at the Computing Center and by competent programmers in other locations. Specific use of the data included the following.

Data collected from Delphi Probe I were analyzed for relative importance of each sub-activity which included the use of mode responses obtained from computer analyses. Variance and standard deviations were analyzed for possible improvement of Delphi Probe II. Information was tallied in order to determine the percentage of the jurors who recommended resequencing of activities. Roberts' Rules of Order permitted

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[145]Norman H. Nie, Dale H. Burt, and C. Hadlai Hull, Statistical Package for the Social Sciences (New York: McGraw-Hill Book Company, 1970).

changes to be made based upon two recommendations from different members of the jury. The percentage information was analyzed for later use.

An analysis of reliability was made for Delphi I using the Alpha Estimate of Reliability program in the SPSS package. A discussion of the obtained values is presented in Chapter V.

Data collected from jurors on Delphi II were analyzed using the same techniques which were used for Delphi I. Particular attention was given to the analysis of convergence of opinion through a careful review and study of variance of responses between Delphi I and II. Specific results of this analysis are included in Chapter V. Tabulations were made of the responses for sequencing the sub-activities and activities of the Phase I Model.

The emphasis of the analysis of Delphi III was to determine the convergence of opinion of the jurors and to ascertain the activities and sub-activities which were included in the Phase II Model, the recommended activity model for V-TECS. The analysis supported the decision to culminate additional probes of the jury and to prepare recommendations for an activity model.

Modifications of the Delphi Technique for the Study

Two modifications of the Delphi Technique were made for the study. First, an a priori activity model was developed and sequenced based upon comprehensive reviews of the literature, studies of seven selected models and projects, and comments from a review panel selected

for feedback purposes. Similar modifications were made by Uhl[146] and Nye[147] for achieving the purposes of their studies.

As the second modification, the mode was selected as the point on the response scale from Delphi I to serve as the point of reference for deliberations by the jury for Delphi probes II and III. Uhl[148] made the same decision to use the mode responses using a rating scale identical to the one used in this study.

Comparative Data Analyses

Comparative analyses of data from Delphi probes I, II, and III were made to prepare tables and figures presenting the results of the study. An analysis of the variances, variance comparisons, studies of percentage of responses, and other related analyses are presented in Chapter V of the report.

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[146]Norman P. Uhl, "Identifying Institutional Goals: Encouraging Convergence of Opinion Through the Delphi Technique" (Durham: National Laboratory for Higher Education, 1971), p. 11.

[147]Phares S. Nye, "A Basic Assessment of the Accrediting Instruments, Activities, and Procedures Used by the Commission on Occupational Education Institutions of the Southern Association of Colleges and Schools" (unpublished Doctoral dissertation, North Carolina State University, Raleigh, 1972).

[148]Uhl, op. cit., pp. 11-12.

CHAPTER IV

THE PHASE I A PRIORI ACTIVITY MODEL FOR THE VOCATIONAL-TECHNICAL EDUCATION CONSORTIUM OF STATES

I. INTRODUCTION

The activities and sub-activities of the Phase I Activity Model for V-TECS were developed and based upon the following procedures:

1. A review of the related literature.
2. A study of selected projects and models.
3. An application of the Criteria for Selection of Activities and Sub-Activities for the Phase I Activity Model, Chapter III.
4. A synthesis and refinement by the Preview Committee included as Appendix C of the report.

Activities and sub-activities were arranged in a priori sequence which was explained in the criteria for selection, Chapter III. The description of the activities and sub-activities included on Delphi Probe I were presented in the exact content as described in the remainder of Chapter IV.

II. THE PHASE I ACTIVITY MODEL

Activity Number I--Determination of Priorities and Assignment of Catalogs

This activity is the first step for developing catalogs of performance objectives and criterion-referenced measures. The activity

has three basic sub-activities which form the rationale and consensus for catalog priority identification and assignment to the member states of V-TECS.

Sub-Activity I-1--State Priority Determination

The member states study data available to them concerning manpower needs, employment opportunities, and student interest surveys to establish a priority list within the state for catalogs of performance objectives and criterion-referenced measures. A state may consider regional and national data to determine its priorities or any other information which it deems necessary or appropriate.[149]

Sub-Activity I-2--Consortium Priority Determination

The Board of Directors of V-TECS will discuss, in turn, the priorities established by each member state. The purpose of this discussion is to develop a priority listing from which the member states may select and be assigned a certain number of catalogs to develop. This sub-activity is to assure that duplication does not occur and that a state has the opportunity to bargain for specific catalogs in which it has a particular interest or for which considerable work has already been accomplished.[150]

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[149]Board of Directors, Minutes, Vocational-Technical Education Consortium of States, Southern Association of Colleges and Schools, Commission on Occupational Education Institutions, Atlanta, Georgia, October, 1973.

[150]Ibid., p. 5.

Sub-Activity I-3--Assignment and/or Selection of Catalogs

The Board of Directors makes the decision concerning the final selection and/or assignment of catalogs after state and consortium priorities have been determined. Two primary considerations are given member states on the selection of a catalog:

1. The state has a particular interest in a domain area.
2. The state has accomplished considerable work in a domain area which would benefit the consortium.

Catalogs assigned by the Board of Directors of the consortium are subject to acceptance by the state involved in the assignment.[151]

Activity Number II--The Memorandum of Agreement

A Memorandum of Agreement is entered between the state selecting or being assigned a catalog to develop and the consortium. The parties of the Memorandum of Agreement are the Chairman of the Board of Directors of V-TECS, the Executive Director of V-TECS, and the person designated by the State's Plan for Vocational Education as the State Director of Vocational Education. This activity has two sub-activities which must be completed prior to the developmental work on a catalog. Sub-activity II-1 identifies the minimum content, and sub-activity II-2 outlines the process of approval of the Memorandum of Agreement.

Sub-Activity II-1--Minimum Contents of the Memorandum of Agreement

The Memorandum of Agreement will be developed by the consortium staff and, after a period of time, will be standardized. The

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[151] Ibid., p. 9.

Memorandum of Agreement will contain the following minimum items:

1. Date and name of catalog domain area.
2. Designated signature blanks.
3. Specific delivery dates for:
   a. domain study and task lists
   b. task analysis and survey results
   c. catalog of performance objectives and criterion-referenced measures
   d. field test period
   e. final catalog and field test results
4. Responsibilities of a full-time technical coordinator in the state and to the consortium.
5. Consortium staff involvement in the development of catalogs and the development of in-service training and dissemination plans.[152]

Sub-Activity II-2--Processing the Memorandum of Agreement

The Memorandum of Agreement will take the following course for development and approval:

1. Format developed and prepared by the consortium staff.
2. Memorandum of Agreement reviewed and signed by the Chairman of the Board of Directors and the Executive Director of V-TECS.
3. Memorandum of Agreement mailed to the states for review and signature by the State Director of Vocational Education.

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[152]Lancaster, "Conflict in Interinstitutional Cooperation," op. cit., p. 4.

4. Designated copies distributed and project starts.[153]

Activity Number III--Domain Study

The domain study consists of thorough and organized research of what has been developed in performance objectives and criterion-referenced measures which might be appropriate and helpful during the development of a catalog. A domain consists of a broad instructional area (such as automotive mechanics) and should include appropriate job titles (e.g., automotive tune-up mechanic, service station mechanic, service station attendant, front end and brake mechanic, general automotive mechanic). Activity III consists of at least four sub-activities.

Sub-Activity III-1--State-of-the-Art Study

This activity increases the probability that consortium projects will find material which has already been partially or fully developed by others in a domain area. The state-of-the-art study will include the following research activities:

1. A search of the ERIC system for germane information.
2. A search of the journal index of ERIC for germane articles.
3. Inquiries to the U. S. Office of Education, National Center for Curriculum Development in Occupational Education.
4. Selected inquiries to state departments of education for germane materials.
5. Inquiries to industrial and private training institutions.

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[153] Ibid., p. 5.

6. Review of the Dissertation Abstract International Index.[154]

Sub-Activity III-2--Task List Development

A comprehensive list of tasks performed by the incumbent worker will be developed as a part of the domain study. The task list will be based upon research completed in the state-of-the-art study (sub-activity III-1), and, in addition, will include the following:

1. A job structure arranged from the lowest job titles to the highest job title within a domain.
2. A coding system applied to the job structure.
3. Development of a task list using the following sources for obtaining task statements:
   a. review of technical procedures used by workers
   b. identification of existing task lists or statements from technical manuals and germane literature
   c. use of craft committees and selected committees of instructors to identify incumbent worker tasks
   d. provision of space for a survey of incumbent workers to add task statements not included on the list[155]

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[154] State-of-the-Art Report, Catalog of Performance Objectives and Criterion-Referenced Measures, Automotive Mechanics (Tallahassee: Florida Department of Education, Division of Vocational Education, 1973).

[155] Raymond E. Christal, The State of the Art in Occupational Research and Development (Lackland Air Force Base, Texas: Occupational Research Division, Air Force Human Resources Laboratory, Air Force Systems Command, July 10, 1973), pp. 1-5.

Sub-Activity III-3--Development of Background Information

This part of the domain study will be used in conjunction with the task list to provide data which may be cross-tabulated and studied with the companion task lists. The background information section will include as a minimum the following:

1. Information about the incumbent worker and/or supervisor:
   a. name and address of incumbent worker
   b. date survey completed by incumbent worker
   c. job title or classification
   d. years and months of experience in career field
   e. years and months of experience in present job title or classification
   f. previous vocational-technical training
   g. private or public school attendance
   h. highest grade level completed or GED equivalent
2. Information about job satisfaction.
3. Information about utilization of talents and prior training.
4. List of equipment and tools used in the jobs of the domain.
5. Type of work environment of the incumbent worker.[156]

Sub-Activity III-4--Reports of the Domain Study

The following reports will be required of the domain study activity: (1) state-of-the-art study--this report includes the methods used to meet the requirements of sub-activity III-1, elements 1, 2, and

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[156] Ibid., p. 4.

3, of the model;[157] (2) background information and task list--this report includes a comprehensive section on background data to be completed by any incumbent workers who are surveyed. Following this section will be a comprehensive task listing which each incumbent worker will be asked to verify in his job classification. He will also be given the opportunity to add any task he is performing which is not included. The background information and task lists will be printed, in booklet form, in a standard format set by the consortium staff and approved by the Board of Directors.[158]

Activity Number IV--Development and Implementation of the Domain Sampling Technique for the Task Statement Survey

The purpose of this activity is to obtain a sample of incumbent workers by a domain area and collect certain information from those sampled to be used later in a task analysis. Survey booklets of task statements are developed and printed using a standard format for the background and task statement information. The sampling design will be developed by an independent agency which has recognized expertise. This activity is divided into three sub-activities dealing with the sample design, sample administration, and processing of the survey results. Alternative procedures are included as a part of sub-activity IV-1 and sub-activity IV-2.

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[157] Technical Specifications for Catalogs of Objectives and Assessment Items, p. 6.

[158] Ibid., p. 7.

Sub-Activity IV-1--Design of the Sample

A. Optimum sample design--The optimum sample design consists of administration of the task statement survey to stratified random sampling of incumbent workers holding a job classified within the domain. The base data to be used in determining the sample size will be the occupational information (coded from the Dictionary of Occupational Titles) collected during the 1970 Census of the United States. The body of the information collected will be statistically analyzed with inferences made to the population. (All workers in the United States in a given job classification within a specific domain.)

B. Alternative sample design #1--The alternative sample design #1 collects information using the same base data as in IV-1(A) but limits the sample to the member states of the consortium and makes no inferences beyond those states surveyed.

C. Alternative sample design #3--The alternative sample design #2 collects information using the same base data as in IV-1(A) but limits the sample to the state which is developing a task survey in a particular domain.[159]

Sub-Activity IV-2--Administration of the Task Statement Survey

A. Optimum administration--The optimum administration of the survey would be conducted through a central staff in the consortium office. This would permit control of the follow-up letters, follow-up

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[159]Reid F. Creech, Research Psychologist, Educational Testing Service, Princeton, New Jersey, "Sampling Design, A paper presented to the Board of Directors of V-TECS, Biloxi, Mississippi, July 5, 1973, pp. 5-9.

telephone calls, and general sequence timing of the surveys. Limitations exist in the application of the optimum administration which are proportionate to the activities selected in sub-activity IV-1.

B. Alternative administration--An alternative method of administration would be to have each state which develops the task statement lists also conduct the survey of incumbent workers based upon the selection of the sample design in sub-activity IV-1. This method is based upon a thorough development of a sampling administration criteria which will be used in the survey efforts.[160]

Sub-Activity IV-3--Processing the Survey Results

The results of the survey will be keypunched or optical scanned and computerized. Various analyses will be made of the data to make decisions about tasks performed by incumbent workers. These survey results are the basis for writing performance objectives and criterion-referenced test items. The analysis would be accomplished by using computer programs designed by the U. S. Air Force for this purpose.[161]

Activity Number V--Task Analysis System

The backbone of the Phase I Activity Model is the system used to develop scientific task analysis information based upon a direct survey of incumbent workers. This effort should affect the quality, realism, and scope of the catalogs of performance objectives. The basic source

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[160] Instructional Systems Materials Development, pp. 123-129.

[161] Christal, op. cit., pp. 11-13.

document for the task analysis system is the task statement survey and background information collected from the incumbent worker. Activity Number V has five basic sub-activities which make up the system of task analysis. These sub-activities have to do with computed indices of task time-spent, task difficulty, task criticality, task perishability, and computer analysis and reporting.

Sub-Activity V-1--Task Time-Spent Index

The incumbent worker completes the background information and checks the tasks he actually performs in the task statement booklet. After checking the task statement, the incumbent worker rates the relative amount of time spent on the task along a seven-point scale. The response on the scale is converted to a time-spent index based on percentages over the total group of task statements checked. The resulting percentage figure is cumulative to 100 percent on all tasks checked. This conversion of information and calculations is accomplished by use of a computer.[162]

Sub-Activity V-2--Task Criticality Index

The incumbent worker rates a task in terms of its critical performance. The primary interest of this part of the task analysis is to ascertain by use of a seven-point scale the relative critical values of each task. When obtained, the index of criticality can be applied to the development of performance objectives. A thorough review of this critical index will identify the tasks which are most critical in

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[162] Ibid., pp. 7-9.

descending order to those which are considered least critical. On the basis of these data, determination can be made regarding the consequences of a poor performance of the critical tasks.[163]

Sub-Activity V-3--Task Difficulty Index

The same process is used to calculate an index of task difficulty which is used in the determination of the time-spent index. A seven-point scale is again employed to determine the incumbent worker's perception of task difficulty. One additional step is included to determine the task difficulty index. The task statement survey is also administered to the immediate supervisor of the incumbent worker. The responses are then correlated, and the resulting figure becomes the difficulty index.[164]

Sub-Activity V-4--Task Perishability Index

The same sampling technique and incumbent workers are used to obtain a perishability index. This index is a measure, on a seven-point scale, of the relative perishability of a task statement currently being performed by the incumbent workers participating in the survey. This index will relate to the need for retraining or refresher courses should the worker not perform, on a continuous basis, those tasks which are rated to have high indices of perishability. One implication of this type of index is to provide guidance for development of self-paced instructional packages which have as a basis the tasks which have the

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[163] Instructional Systems Materials Development, pp. 134-136.

[164] Ibid., pp. 14-16.

higher perishability indices. Retraining and development of materials could be minimized by not including objectives for tasks which do not tend to perish.[165]

Sub-Activity V-5--Processing of Data and Development of Reports

The information collected from sub-activity V-1, V-2, V-3, and V-4 will be computerized for statistical analysis. Information collected during the surveys will be transformed from qualitative data to quantitative data. The quantitative data will produce the index values of time spent, criticality, difficulty, and perishability. Many other statistical analyses can be applied to these data for the purpose of rank ordering, multiple regression analysis, crosstabulation of tasks with elements and sub-elements of the background information, etc. The resulting printouts will be furnished to the state developing the catalog of performance objectives and criterion-referenced measures as a basis for their development of performance objectives and criterion-referenced measures.[166]

Activity Number VI--Technical Preparation of Staff and State Coordinators

The technical preparation and training of the consortium staff and the technical coordinators in the states are paramount to maintaining quality control. A program of technical development will begin with

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[165]This information is based upon a personal interview with Dr. Walter E. Driskill, Chief, Occupational Career Development Branch, Occupational Measurement Squadron, Lackland Air Force Base, Texas, March 15, 1973.

[166]Christal, op. cit., p. 9.

an orientation to the model to insure that technical skills and knowledge are sufficiently developed to provide maximum quality control. This activity is divided into five sub-activities which form the basis for staff preparation and training and are as follows:

Sub-Activity VI-1--System Orientation

A program designed to insure the performance of consortium staff and technical coordinators will be administered. The orientation is in performance terms with each person satisfactorily completing required tasks at a criterion-based performance level. Orientation to the system will not be considered complete until the performance standards are met by the consortium staff and the technical coordinators.[167]

Sub-Activity VI-2--Interpretation of Task Analysis Data

An intensive training plan will guide the preparation of consortium staff and personnel within the states to utilize effectively the data from the task analysis system. This training will assist personnel in the determination of index measures of tasks which are sufficiently high to use in a catalog. Optimum index rating scores will be developed when experience demonstrates that such a rating is feasible. Any tasks which fall below the desired index rating or combination of indice ratings will be excluded from conversion to performance objectives. Continuous training will be conducted for personnel as the task analysis system develops and the analysis of the research

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[167]Straubel, "Development of a Course for Training . . .," op. cit., pp. 22-23, 54-55.

indicates a need for further training.[168]

Sub-Activity VI-3--Developing Skills in Writing Performance Objectives

Workshops, seminars, and conferences will focus on the development of skills needed to write performance objectives. Consortium staff and technical coordinators will be expected to demonstrate their ability to take a given set of task statements and data and develop written performance objectives.[169]

Sub-Activity VI-4--Preparing Criterion-Referenced Test Items

Following the training of the staff and technical coordinators in the skills of writing performance objectives from task analysis data and task statements, intensive efforts will be introduced to develop companion criterion-referenced test item(s) for each performance objective. A task statement will yield one or more performance objectives, and a performance objective will yield one or more criterion-referenced test items. Test writing experts will serve as consultants for training consortium staff and state technical coordinators. Personnal will either be sent to the source of technical expertise or the experts will be assembled in conference, seminar, or workshop settings.[170]

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[169] Developing Performance Objectives (Lansing: Michigan Department of Education, n.d.).

[170] W. James Popham, Criterion-Referenced Instruction (Englewood Cliffs, N. J.: Educational Technology Publications, 1972).

Sub-Activity VI-5--Monitoring and Quality Control of Personnel, Education, and Training

The consortium staff and state technical coordinators will develop individual plans of technical preparation for themselves under guidelines developed by the Board of Directors of V-TECS. These plans will serve as a guide to ensure minimum competence levels of personnel of the consortium staff and within the states. The Executive Director of the consortium has the ultimate responsibility for monitoring individual training programs of the consortium staff and technical coordinators in the states. The Board of Directors will receive at least a biannual status report of the technical preparation activities designed for individual consortium staff and technical coordinators within the states. Reports of this nature may be requested any time the Board of Directors desires to know the status of the total plan or individual progress of personnel.[171]

Activity Number VII--Development of Catalogs of Performance Objectives and Criterion-Referenced Measures

The activities subsequent to Activity VII have emphasized primarily the following: training and preparation of personnel, collection and analysis of information, and other preliminary steps necessary to write and catalog performance objectives and criterion-referenced measures. This activity is the application stage of the model.

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[171]Straubel, "Developing a Course for Training . . .," op. cit., pp. 49-53.

Information from incumbent workers is combined with the knowledge of selected instructors, curriculum specialists, criterion-referenced test designers, and educational researchers to transpose the resulting data into meaningful test items. Activity VII contains five sub-activities designed to accomplish this task and are as follows.

Sub-Activity VII-1--Selection of a Project Director

Each state developing a catalog of performance objectives and criterion-referenced measures will select a person to serve as project director. The project director selects and manages writing teams which are composed of selected instructors in the domain being developed. The writing teams are trained by the project director and state technical coordinator to analyze the data resulting from the task analysis system, the findings of the state-of-the-art study, and other pertinent information. The project director is responsible for submitting to the coordinator in the state the results of studies and analyses of data, catalogs of performance objectives and criterion-referenced measures, and other products required by the Memorandum of Agreement, Activity II.[172]

Sub-Activity VII-2--Selection and Preparation of the Writing Teams

1. Selection of Writing Teams--The project director and technical coordinator screen possible writing team candidates and select those instructional personnel which they determine have the potential and

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[172] Technical Specifications for Catalogs of Objectives and Assessment Items, p. 11.

interest to write performance objectives and criterion-referenced measures. The writing team will consist of a minimum of one person having knowledge and experience in developing criterion-referenced measures, one person having either local or state supervisory responsibility over the domain being developed, and two instructors in the subject area. Each writing team should have a preferred alternate member who has responsibility in curriculum development at the local or state level.[173]

2. Preparation of Writing Teams--The technical coordinator will have the primary responsibility of assisting the project director in the training of the writing team members. The total design of the model will be explained--the results of the state-of-the-art study, the task analysis system, and the conversion process from task statements to performance objectives. Companion criterion-referenced measures will be prepared which are used on the job when these standards are available. Components of the training program developed for the consortium and state technical coordinators will be used as the basis for training and preparing the writing teams for their tasks.[174]

Sub-Activity VII-3--Writing Performance Objectives

All performance objectives developed by the writing teams will meet the definitions and quality criteria set forth in the Memorandum of Agreement. The components of the performance objective will contain

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[173]Bailey, Bland, and Brown, op. cit.

[174]Ibid., pp. 23-25.

the following requirements: situation confronting the learner, action required of the learner, object on which learner is to operate, limits of performance, measurability of the action, communicability of the objective, and degree of proficiency required of the learner.[175]

Sub-Activity VII-4--Preparing Criterion-Referenced Measures

Each performance objective will have one or more companion criterion-referenced test items to be used by instructional personnel. The test items will be studied to ensure that a definite relationship exists between the criterion-referenced item and the standard of performance stated in the performance objective. The definition and components of an acceptable criterion-referenced measure are spelled out in the Memorandum of Agreement and will include: congruence with the performance objective, comprehensibility (expressed at a proper reading level for the level of the training program), objectivity of the test item, integrity expressed in terms of sufficient evidence that the learner can perform the corresponding objective, and equivalence within the test items. The criterion-referenced test items will be developed by the writing teams which develop the performance objectives under the technical direction of the person on the team with test item experience, the director of the project, the technical coordinator in the state, and the technical specialist on the consortium staff.[176]

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[175] Ibid., pp. 30-32.

[176] Technical Specifications for Catalogs of Objectives and Assessment Items, p. 11.

Sub-Activity VII-5--Developing the Catalog of Performance Objectives and Criterion-Referenced Measures

The performance objectives and criterion-referenced measures will be coded by job classification within the domain being developed. This coding system will be developed by the consortium and applied to all products of the consortium. Catalog format and content are outlined in detail and are available through the technical coordinator in each state. All catalogs will be furnished in final draft form (camera ready) for mass production.[177]

Activity Number VIII--Field Testing and Commonality Study

This activity is designed to determine the instructional validity of the performance objectives and criterion-referenced measures. The degree of validity will be determined by analysis of teacher and instructor responses to questions during the field test portion of each project. Field test sites and conditions will be selected by the application of a criterion developed by the Board of Directors, consortium staff, and technical coordinators. Activity VIII consists of two sub-activities as follows.

Sub-Activity VIII-1--Field Testing Design

The field test is designed to control the variables under which the catalogs will be tried by teachers and instructors. Controls are placed upon the selection of the site of field testing, supervisory and

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[177] Ibid.

administrative support and interest, instructor or teacher interest and ability, type of facilities and equipment, and level of students (junior high, secondary, post-secondary, etc.). The primary emphasis is placed upon determining comprehensability, utility, and appropriateness for instruction as perceived by the teachers and instructors. Constraints which prevent the use of a given performance objective and companion criterion-referenced measures are identified by the instructional personnel.[178]

Sub-Activity VIII-2--Commonality Review

During the field test, several reviews of performance objectives are made by teachers and instructors for the purpose of identifying the common performance objectives across a wide group of occupational education programs. This commonality study identifies those common performance objectives within the catalog which are applicable in several occupational domains. The common core identified is analyzed for implications for curriculum design in general shop, pre-vocational, and comprehensive career education programs.[179]

Activity Number IX--Computerize Performance Objectives and Criterion-Referenced Measures

The primary purpose of this activity is to provide immediate response to the states' requests for catalogs. The computer banking of

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[178]Development of Criterion-Referenced Instruments for Distributive Education (Tallahassee: Florida Department of Education, Division of Vocational-Technical and Adult Education, June 30, 1972), pp. 2-5. (Project No. VTAD-S, C 3-0007.)

performance objectives and criterion-referenced measures eliminates the time consuming and costly step of technical editing each time a catalog is revised and updated. Since only those objectives actually changed will be accessed from the computer, the majority remain unchanged and may be retrieved and printed in the same manner each time. Research capabilities, as well as many management possibilities, exist when the computer is used to do time-consuming calculation, compiling, and cataloging of performance objectives and criterion-referenced measures. This activity contains three sub-activities as follows.

Sub-Activity XI-1--Developing Computer Bank of Performance Objectives and Criterion-Referenced Measures

After field testing, the catalogs of performance objectives and criterion-referenced measures are processed and placed in a computer bank for rapid retrieval. The coding system adopted by the consortium is the key to the retrieval system for the computerized information. The information is arranged so that it may be retrieved by domain area or any coded job within a domain. A member of the consortium may request the total catalog or any of its sub-parts for use in curriculum design and curriculum building. Information is recorded concerning the perceptions of the teachers and instructors during the field test and commonality review. The perceptions concern the comprehensiveness, utility, and appropriateness of the performance objectives and criterion-referenced measures for instruction. In addition, the perceptions concerning the commonality of performance objectives, across several

programs in occupational education, are collected for analysis.[180]

Sub-Activity IX-2--Research Aspects of the Computerized Performance Objectives and Criterion-Referenced Measures

1. Field Test Data--Information collected during the field test activity is analyzed by the computer. The purpose of this analysis is to identify those performance objectives and criterion-referenced measures which appear to be defective. When the defective objectives and measures have been identified, they are forwarded to the state which developed the catalog with instructions for removing the possible defects.

2. Commonality Review--The results of the commonality review by teachers and instructors form the basis for the identification of core performance objectives. This common core provides a basis for planning curriculum for pre-vocational, general shop, related subjects, and career education programs. The common performance objectives provide a framework for prerequisite skills, knowledge, and abilities needed by students to further their preparation for employment at a higher level.

3. Cross-Analysis Research--Computer programs will be utilized which cross-tabulate and cross-analyze data received from teachers and instructors with data collected from the task analysis based upon surveys of incumbent workers and their immediate supervisors. The research implications of the data are unlimited when incorporated into the Revision and Updating Activities of the model.[181]

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[180] Ibid.

[181] Ibid.

Sub-Activity IX-3--Management of Performance Objectives and Criterion-Referenced Measures

The application of a code number to each performance objective which relates it to a specific domain and, within the domain, to a specific job classification provides an added degree of manageability.[182] The performance objectives will be retrieved from the computer bank by job classification, by total domain, by commonality elements, or other mixes required for planning various training programs. The computer can be used to compile the catalog by printing out performance objectives in any desired structure or sub-structure within a domain.[183] Training programs for a new or expanding industry may be designed and retrieved from the omputer and can provide the performance objectives which correlate with the job structure of the new industry. The resulting performance objectives provide a realistic planning base for curriculum which must be tailor-made for the task at hand. Many other curriculum management advantages can be developed upon this computer bank of performance objectives. The curriculum design implications are limited only by financial resources and human ingenuity.

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[182]William F. Wieser, Catalog of Performance Objectives and Criterion-Referenced Measures for Auto Mechanics (Tallahassee: Florida Department of Education, Division of Vocational, Technical, and Adult Education, 1972).

[183]Easton, op. cit.

Activity Number X--In-Service Education and Dissemination Plans

Each state using the materials of the consortium will develop a comprehensive plan for disseminating the catalogs of performance objectives and criterion-referenced measures. In addition, a comprehensive in-service training program must be developed which is designed to prepare both instructional personnel and supervisory personnel in the techniques of managing performance-based instruction. Performance-based instruction requires a thorough knowledge and new skills for teachers and their managers if it is to achieve the desired results. This activity contains two sub-activities which are directed toward the achievement of an acceptable degree of implementation of performance-based instruction in the classrooms, laboratories, and shops of participating states.

Sub-Activity X-1--In-Service Education

A requirement of consortium membership is the development, by each state, of an in-service education program for teachers and managers of teachers who will begin to use the catalogs of performance objectives and criterion-referenced measures. The in-service program should be designed to instruct personnel on the intention of the catalog, how to select performance objectives and criterion-referenced measures, and how to supplement the selection with curriculum materials and student learning activities. Those who supervise, direct, or administer programs and have direct contact with the teacher who will be using the material should be trained in the management aspects of performance-based

instruction. The specific requirements of the in-service education plan are developed and/or modified by the Board of Directors of V-TECS.[184]

Sub-Activity X-2--Dissemination of Materials

A dissemination outline to be developed by the Board of Directors of V-TECS should serve as a guide for the states. The specific methods of dissemination are left entirely to the participating states. The consortium staff will assist the states as needed and will encourage the dissemination plan to be integrated with the in-service education plan when at all possible. Such integration should ensure proper preparation of the users and managers of the learning process and, at the same time, provide a logical point of dissemination.[185]

Activity Number XI--Revision and Updating of the Catalogs

The rapid rate of change in a technical society mandates a better way of keeping vocational-technical instructional materials up to date; but, more importantly, it mandates keeping them relevant to the needs of a modern job structure. This activity is designed to maximize input from instructional personnel, craft advisory committees, and the incumbent worker so that catalogs may be revised on a scientific and

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[184] Agreement Form and Organizational Structure for a Multi-State Consortium to Produce Performance Objectives and Criterion-Referenced Measures in Occupational Education (Atlanta: Southern Association of Colleges and Schools, Commission on Occupational Education Institutions, June, 1973), p. 4.

[185] Ibid., p. 3.

as-needed basis. This activity contains four sub-activities which form a cycle for revising and updating the catalogs. The cycle will take approximately three years to complete with a decision to revise and update or not to revise and update at the eighteen-month point in the cycle.

Sub-Activity XI-1--Field Utilization Study

Continuous field study is made regarding the catalogs of performance objectives and criterion-referenced measures. The purpose of the field study are to (1) detect the defective performance objectives and criterion-referenced measures, (2) identify additional performance objectives which may need to be added to the catalog when it is revised, and (3) obtain a wider participation in the developmental activities, particularly in the curriculum materials development.

The field utilization study has two major components for achieving the purposes:

1. Teacher and Instructor Input--During the first year of use, the teacher is asked to react to questions concerning readability, comprehensibility, specificity, and appropriateness of performance objectives and criterion-referenced measures. This information is added to the body of data already existing on the performance objective as a result of the commonality study and the field test results.[186]

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[186] Development of Criterion-Referenced Instruments for Distributive Education, p. 5.

2. Craft Advisory Committee Input--Early in the second year, the craft advisory committee for the program using the material reviews each performance objective and responds to questions concerning (a) the utility of the objective, (b) the appropriateness for present job requirements, (c) the extent to which the performance objective is accomplished by entry level employees, relatively experienced employees, and experienced employees, and (d) the relative criticality of the performance objective.

Sub-Activity XI-2--Analysis of Data from Field Utilization Study

The information collected from the field utilization study is computerized, and reports are developed to determine the results. Statistical analysis is applied to the data to accomplish the purposes of the field utilization study. Data are compared with the results of sub-activity XI-3, survey of incumbent workers, for the purpose of deciding whether the catalog should be revised and updated or if it is still sufficiently valid for continued use.[187]

Sub-Activity XI-3--Conducting New Task Analysis

The same procedure used in Activity V, task analysis system, is used at the fifteen-month point in the revision and updating cycle. The same task statements are used with the exception that those added by incumbent workers on the initial survey are included for this survey application.

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[187]Easton, op. cit.

Additional information requested of the incumbent worker is in regard to tasks not on the list. The worker is asked to add any tasks he is now doing which do not appear on the list and place an asterisk by those task statements which he has begun to perform for the first time during the last twelve months.[188]

Sub-Activity XI-4--Decision Criteria for Revising and Updating

The information collected on the new task analysis is computerized and analyzed. The purpose of the analysis is to determine the extent of new tasks identified by incumbent workers which have been accomplished for the first time during the immediately past twelve months. A review of the results of the field utilization study (sub-activity XI-1) and the survey of incumbent workers forms the basis for the decision regarding the need for revision and updating of the catalogs. If the data suggest a need for revision, the catalogs are put through the same process as for their initial development.[189]

Activity Number XXI--Third Party Evaluation of the Vocational-Technical Education Consortium of States

Evaluation of the consortium on a biennial basis is considered desirable by the Board of Directors of V-TECS. A group of third party evaluators will be selected on a low bid basis to come into the organization to evaluate and review the processes being used. This type of

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[188] Instructional Systems Materials Development, pp. 134-137.

[189] Ibid., pp. 378-379.

review has important advantages and will serve as a basis for self-renewal. This activity contains three sub-activities which are as follows:

Sub-Activity XII-1--Selection of the Evaluation Team

The Board of Directors of V-TECS will identify on a low bid basis a third party evaluator from states outside the membership to evaluate and make recommendations concerning the total organization and its procedures. This evaluation shall occur within the first two years of the operation and every two years thereafter. The Board of Directors selects and employs the evaluators and sets broad guidelines for their study.[190]

Sub-Activity XII-2--Evaluation and Report of Results

The evaluation is conducted by a team named by the Board of Directors. The chairman of the team is selected by the Board of Directors. The results of the evaluation are forwarded to the Chairman of the Board of Directors of V-TECS with a copy transmitted concurrently to the Director of the Southern Association of Colleges and Schools, the Executive Secretary of the Commission on Occupational Education Institutions, and the Executive Director of V-TECS.[191]

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[190]Leon M. Lessinger, Every Kid a Winner (New York: Simon and Schuster, 1970), pp. 79-80.

[191]Ibid., p. 81.

Sub-Activity XII-3--Implementation of the Recommendations of the Evaluation

The Board of Directors of V-TECS reviews the evaluation results and directs the implementation of the recommended changes as it deems necessary and expedient. The administering agency files its response to the Board of Directors for consideration prior to implementation of recommendations made by the evaluation team.[192]

Figure 3 was developed to illustrate the chronological relationship and internal relationship of the activities and sub-activities. The layout of the sequence chart was planned for eventual application of the PERT method of project management and control. Figure 2 provides information concerning the twelve activities, forty-one sub-activities which were included in the Phase I A Priori Activity Model.

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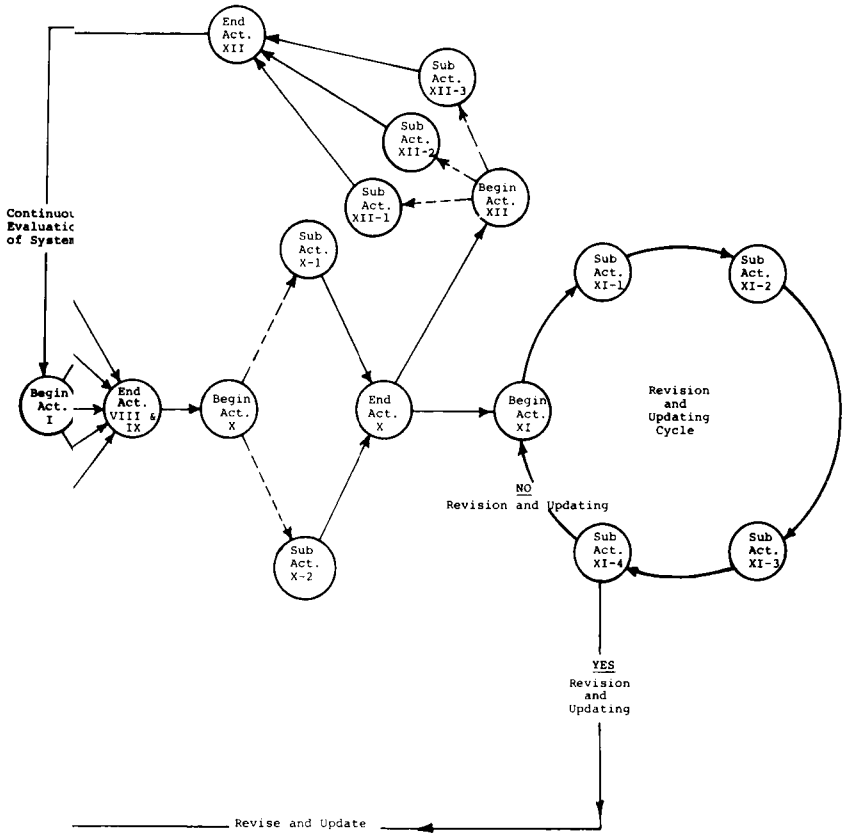
[192] Ibid., p. 82.



I. DE!VES AND
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!D CRITERION-

X. IN-SERVICE EDUCATION AND DISSEMINATION PLANS
- X-1. IN-SERVICE EDUCATION
- X-2. DISSEMINATION OF MATERIALS

XI. REVISION AND UPDATING OF THE CATALOGS
- XI-1. FIELD UTILIZATION STUDY
- XI-2. ANALYSIS OF DATA FROM FIELD UTILIZATION STUDY
- XI-3. CONDUCTING NEW TASK ANALYSIS SURVEY
- XI-4. DECISION CRITERIA FOR REVISING AND UPDATING CATALOGS

XII. THIRD PARTY EVALUATION OF THE VOCATIONAL-TECHNICAL EDUCATION CONSORTIUM OF STATES
- XII-1. SELECTION OF THE EVALUATION TEAM
- XII-2. THE EVALUATION AND REPORT OF RESULTS
- XII-3. IMPLEMENTATION OF THE RECOMMENDATIONS OF THE EVALUATION

CHAPTER V

PRESENTATION AND DISCUSSION OF DATA

Data were collected by the use of three Delphi probes of a jury of experts. The resulting information was processed by computers at The University of Tennessee. Chapter V was divided into an introduction and six sections for presenting the data in the same chronological manner that data were collected and analyzed. The six sections were: (1) Summary of Responses from the Jury of Experts; (2) Analysis of Instrumentation; (3) Analysis of Data from Delphi Probe I; (4) Analysis of Data from Delphi Probe II; (5) Analysis of Data from Delphi Probe III; and (6) Convergence of Opinion as a Result of Delphi Probes I, II, and III.

I. SUMMARY OF RESPONSES FROM THE JURY OF EXPERTS

Forty experts selected by the criteria cited in Chapter II were invited to participate in the research study. Thirty-eight agreed to serve and two declined to serve because of heavy project work loads. Thirty-seven of the thirty-eight responded to Delphi Probe I. One response was not useable; because of the design of the instrument and of the study, the juror was dropped from further participation. Table 1 presents a summary of the responses for the three Delphi probes. The 98.2 percent response rate of the jury of experts was considered adequate for the purpose of the study. Further presentation of data and analysis

TABLE 1

SUMMARY OF RESPONSES OF THE JURY OF EXPERTS
TO DELPHI PROBES I, II, III

Probes	No. of Probes Mailed	No. of Probes Returned	No. of Probes Useable	Percent Response
Delphi Probe I	38	37	36	97.4
Delphi Probe II	36	36	36	100.0
Delphi Probe III	36	35	35	97.2
TOTALS	110	108	107	98.2

are presented under each specific section having to do with the three probes.

II. ANALYSIS OF THE INSTRUMENTATION

The rating scale, which was divided into classifications of "IS" (realistic rating of importance) and "SHOULD BE" (idealistic or unconstrained rating of importance), was adopted from a research project of the National Laboratory for Higher Education, "Identifying Institutional Goals: Encouraging Convergence of Opinion Through the Delphi Technique" conducted by Norman P. Uhl[193] of the Educational Testing Service, Princeton, New Jersey. The five-point rating scale, with assigned values cited in Chapter III was modeled after the instrument used in the Uhl research project. One modification of the values of the rating scale was made. Uhl used low numbers to represent the high ratings on the scale, while the scale for this study used high numbers for the high ratings.

Reliability of the Delphi I instrument was measured by the use of Alpha Coefficient.[194] The Statistical Package for the Social Sciences (SPSS), Subprogram Reliability, was used to process the data at The University of Tennessee Computing Center. Table 2 presents the results of the processing of data for reliability. Scales were established which divided the instrument into twelve divisions. This method,

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[193]Uhl, op. cit.

[194]Lee J. Cronbach, "Coefficient Alpha and the Internal Structure of Tests," Psychometrika, XVI, No. 3 (September, 1951), 297-333.

TABLE 2

ALPHA COEFFICIENTS OF RELIABILITY--DELPHI PROBE I

Scales	Sub-Activities in the Scale (Both "IS" and "SHOULD BE")	Alpha Coefficients
Scale 1	I-1, I-2, I-3	0.625
Scale 2	II-1, II-2	0.689
Scale 3	III-1, III-2, III-3, III-4	0.805
Scale 4	IV-1, IV-2, IV-3	0.824
Scale 5	V-1, V-2, V-3, V-4	0.750
Scale 6	VI-1, VI-2, VI-3, VI-4, VI-5	0.824
Scale 7	VII-1, VII-2, VII-3, VII-4, VII-5	0.716
Scale 8	VIII-1, VIII-2	0.769
Scale 9	IX-1, IX-2, IX-3	0.838
Scale 10	X-1, X-2	0.640
Scale 11	XI-1, XI-2, XI-3, XI-4	0.822
Scale 12	XII-1, XII-2, XII-3	0.918
Alpha Coefficient for Instrument		0.768

according to Cronbach,[195] will produce measures of reliability as accurately as split-half, even-odd, or other such arbitrary divisions. The Alpha Coefficient program in SPSS permits analysis of multiple response scales under the conditions of no right or wrong answer. The computed values obtained are considered conservative estimates of reliability.[196] Cronbach referred to Alpha Coefficients of .70 or over to be fairly large coefficients.[197] The Alpha Coefficient value of .768 was considered adequate for the purposes of the study. A discussion of the comparative estimates of Alpha was included under Section VI of Chapter V of the report.

The formula used to calculate values of the Alpha Coefficient was:

$$a = \frac{n}{(n-1)} \quad 1 - \left(\frac{\leq V_i}{V_s} \right).$$

When n is the number of items in the scale, V_i is the sum of the item variance, and V_s is the variance of the scale scores.

III. ANALYSIS OF DATA FROM DELPHI PROBE I

Delphi Probe I consisted of twelve major activities and forty-one sub-activities. The jury of experts responded to each sub-activity in terms of its relative importance on a five-point scale. The jurors were asked to give ratings of importance under "IS" (realistic) and "SHOULD BE"

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[195] Ibid., pp. 310-311.

[196] Ibid., pp. 307-308.

[197] Ibid., pp. 311.

(idealistic) conditions. The jurors responded to the sequencing of activities on response mechanisms placed at the end of each major activity. Table 3 provides information concerning the mode response of the jury of experts, the number responding to the mode, the mean, the standard deviation, and the percent responding at the 3.0 level (of medium importance) or higher. Table 4 indicates the responses of the jurors in regard to sequencing of activities on Delphi Probe I. The data in Table 3 were used along with the data in Table 4 to determine the sub-activities and the new sequential arrangement recommended by the jury. The criteria cited in Chapter III for maintaining or eliminating activities were applied using the data in Tables 3 and 4 to determine the content of Delphi Probe II.

Table 5 provides a summary of the changes in the activities and sub-activities recommended by the jury of experts on Delphi Probe I. Six new sub-activities were added by the jury of experts on the first probe. Four major activities were resequenced. One sub-activity recommended for resequencing by three of the jurors was resequenced from sub-activity VII-1 to sub-activity II-3. The criteria for acceptance of the sequencing was applied to the data; even though a high degree (92.2 percent) of concurrence was achieved, the jurors were asked to react to the sequencing response mechanism on Delphi Probe II.

Table 6 provides a summary of the mode, mean, and standard deviation by major activity included in Delphi Probe I. The decision was made to use the modal response to report convergence of opinion because of the relative mathematical closeness of the mean to the mode. In all cases, the mode was less than one point on the scale from the

TABLE 3

MODE, NUMBER OF RESPONDENTS REPRESENTING THE MODE, MEAN, STANDARD DEVIATION, PERCENT OF RESPONSES ABOVE 3.0 BY "IS" AND "SHOULD BE" AND BY SUB-ACTIVITY FOR DELPHI PROBE I (N=36)

Activity and Sub-Activity	IS					SHOULD BE				
	Mode	No. of Responses on Mode	Mean	Standard Deviation	Percent of Responses 3.0 & Above	Mode	No. of Responses on Mode	Mean	Standard Deviation	Percent of Responses 3.0 & Above
ACTIVITY I										
Sub-Act. I-1	4.000	15	3.611	.838	65.6	5.000	19	4.389	.766	88.9
Sub-Act. I-2	4.000	18	4.056	.715	100.0	4.000	19	4.361	.593	100.0
Sub-Act. I-3	4.000	19	3.833	.941	97.2	5.000	15	4.194	.786	100.0
ACTIVITY II										
Sub-Act. II-1	4.000	13	3.889	1.116	91.7	5.000	21	4.306	1.091	94.4
Sub-Act. II-2	4.000	17	3.778	.866	91.7	4.000	13	3.972	9.10	94.4
ACTIVITY III										
Sub-Act. III-1	4.000	15	3.806	.951	88.9	5.000	17	4.361	.683	100.0
Sub-Act. II-2	4.000	17	3.833	1.276	86.1	5.000	28	4.639	.931	97.2
Sub-Act. III-3	3.000	16	3.306	1.064	97.2	5.000	13	3.667	1.394	91.7
Sub-Act. III-4	4.000	16	3.444	1.206	83.3	4.000	21	4.111	.919	97.2
ACTIVITY IV										
Sub-Act. IV-1	4.000	15	3.722	1.059	91.7	4.000	17	4.250	.692	100.0
Sub-Act. IV-2	4.000	17	3.594	.785	94.4	4.000	15	4.194	.749	100.0
Sub-Act. IV-3	4.000	14	3.778	1.222	86.1	4.000	16	4.194	1.091	94.6
ACTIVITY V										
Sub-Act. V-1	4.000	15	3.833	.910	91.7	4.000	16	4.194	.786	97.2
Sub-Act. V-2	4.000	17	3.722	.849	91.7	5.000	17	4.278	.815	97.2
Sub-Act. V-3	4.000	16	3.472	1.028	86.1	5.000	15	3.972	1.158	91.7
Sub-Act. V-4	3.000	14	3.361	.961	80.6	5.000	15	4.083	.937	94.4
Sub-Act. V-5*	-	-	-	-	-	-	-	-	-	-

TABLE 3 (continued)

Activity and Sub-Activity	IS					SHOULD BE				
	Mode	No. of Responses on Mode	Mean	Standard Deviation	Percent of Responses 3.0 & Above	Mode	No. of Responses on Mode	Mean	Standard Deviation	Percent of Responses 3.0 & Above
ACTIVITY VI										
Sub-Act. VI-1	4.000	15	3.917	1.273	86.1	5.000	22	4.583	.554	100.0
Sub-Act. VI-2	4.000	13	4.056	.860	97.2	5.000	25	4.649	.593	100.0
Sub-Act. VI-3	5.000	16	4.250	.806	97.2	5.000	27	4.750	.439	100.0
Sub-Act. VI-4	4.000	15	4.139	.867	97.2	5.000	29	4.778	.485	100.0
Sub-Act. VI-5	4.000	14	3.750	1.228	91.7	4.000	18	4.278	1.003	97.2
ACTIVITY VII										
Sub-Act. VII-1	4.000	12	3.694	1.283	86.1	5.000	20	4.278	1.162	91.7
Sub-Act. VII-2	4.000	17	3.694	1.167	86.1	5.000	24	4.639	.543	100.0
Sub-Act. VII-3	5.000	17	4.250	.874	94.4	5.000	29	4.750	.604	97.2
Sub-Act. VII-4	4.000	16	4.111	.854	94.4	5.000	28	4.750	.500	100.0
Sub-Act. VII-5	4.000	17	3.861	1.018	94.4	4.000	15	4.167	1.000	97.2
ACTIVITY VIII										
Sub-Act. VIII-1	4.000	16	3.899	.854	94.4	5.000	20	4.500	.609	100.0
Sub-Act. VIII-2	4.000	15	3.639	.990	94.4	5.000	16	4.167	1.028	94.4
ACTIVITY IX										
Sub-Act. IX-1	4.000	17	3.750	1.180	86.1	5.000	19	4.278	1.111	97.2
Sub-Act. IX-2	4.000	14	3.639	1.046	91.7	4.000	21	4.111	.919	97.2
Sub-Act. IX-3	4.000	17	3.972	.845	94.4	5.000	17	4.333	.717	97.2
ACTIVITY X										
Sub-Act. X-1	4.000	13	3.944	1.120	91.7	5.000	29	4.639	.961	97.2
Sub-Act. X-2	4.000	15	3.694	1.009	94.4	4.000	17	4.222	.959	97.2

TABLE 3 (continued)

Activity and Sub-Activity	IS Mode	IS No. of Responses on Mode	IS Mean	IS Standard Deviation	IS Percent of Responses 3.0 & Above	SHOULD BE Mode	SHOULD BE No. of Responses on Mode	SHOULD BE Mean	SHOULD BE Standard Deviation	SHOULD BE Percent of Responses 3.0 & Above
ACTIVITY XI										
Sub-Act. XI-1	4.000	12	3.944	.924	94.4	5.000	24	4.583	.649	100.0
Sub-Act. XI-2	4.000	14	3.778	1.124	88.9	4.000	17	4.361	.683	100.0
Sub-Act. XI-3	4.000	12	3.556	1.157	83.3	4.000	16	4.139	.990	97.2
Sub-Act. XI-4	4.000	12	3.583	1.273	86.1	5.000	18	4.250	1.025	97.2
ACTIVITY XII										
Sub-Act. XII-1	4.000	13	3.444	.998	83.3	4.000	17	4.000	.926	94.6
Sub-Act. XII-2	3.000	16	3.500	1.000	88.9	4.000	12	3.907	.996	94.6
Sub-Act. XII-3	4.000	11	3.694	1.091	86.1	4.000	16	4.028	.941	94.6

*Response Scale omitted by typist, included in Delphi Probe II.

TABLE 4

SEQUENCING RESPONSES MADE BY THE JURY OF EXPERTS, DELPHI PROBE I, BY NUMBER OF RESPONDENTS, PERCENTAGE OF RESPONDENTS BY CATEGORY AND BY ACTIVITY (N=36)

Activity No.	PROPERLY SEQUENCED		IMPROPERLY SEQUENCED		Non-Respondents	Percent Non-Responses
	No. of Respondents	Percent Agreement	No. of Respondents	Percent Agreement		
I	33	91.6	2	5.6	1	2.8
II	32	88.8	3	8.4	1	2.8
III	33	91.7	1	2.8	2	5.5
IV	32	88.8	3	8.4	1	2.8
V	33	91.7	2	5.5	1	2.8
VI	32	88.8	3	8.4	1	2.8
VII	34	94.4	1	2.8	1	2.8
VIII	35	97.2	-	-	1	2.8
IX	35	97.2	-	-	1	2.8
X	32	88.8	3	8.4	1	2.8
XI	34	94.4	1	2.8	1	2.8
XII	33	91.7	1	2.8	2	5.5
TOTALS	398	92.2	20	4.6	14	3.2

TABLE 5

SEQUENCING CHANGES AND ADDITIONS RECOMMENDED BY JURY OF EXPERTS
ON DELPHI PROBE I USED FOR DEVELOPING DELPHI PROBE II

Master Sequence Chart Delphi Probe I	New Sub-Activities	Resequenced Activities	Resequenced Sub-Activities	Comments
Sub-Act. I-3	X			Added by Jury of Experts on Probe I
Sub-Act. II-3			X	Formerly Sub-Activity VII-1 on Probe I.
Sub-Act. III		X		Formerly Activity VII on Probe I.
Sub-Act. III-2	X			Added by Jury of Experts on Probe I.
Sub-Act. IV		X		Formerly Activity III on Probe I.
Sub-Act. V		X		Formerly Activity IV on Probe I.
Sub-Act. VI		X		Formerly Activity V on Probe I.
Sub-Act. VIII-3	X			Added by Jury of Experts on Probe I.

TABLE 5 (continued)

Master Sequence Chart Delphi Probe I	New Sub-Activities	Resequenced Activities	Resequenced Sub-Activities	Comments
Sub-Act. VIII-4	X			Added by Jury of Experts on Probe I.
Sub-Act. IX-4	X			Added by Jury of Experts on Probe I.
Sub-Act. X-1	X			Added by Jury of Experts on Probe I.

TABLE 6

MODES, MEANS, AND STANDARD DEVIATIONS FOR DELPHI PROBE I (N=36)

Activity	Mode	Mean	Standard Deviation
I	4.000	4.032	.773
II	4.000	3.986	.996
III	4.000	3.896	1.053
IV	4.000	3.980	.933
V	4.000	3.864	.930
VI	5.000	4.314	.811
VII	5.000	4.192	.900
VIII	4.000	4.049	.870
IX	4.000	4.013	.970
X	5.000	4.125	1.012
XI	5.000	4.024	.978
XII	4.000	3.764	.992

mean calculation. The modal response provided a convenient reference point for reaction by the jury of experts on Delphi Probe II.

A similar decision to use modal responses was made by Uhl[198] in his study. Figure 4 provides a profile of mean responses of the jurors to the activities on Delphi I by "IS" and "SHOULD BE." Figure 5 presents a profile of mode responses to the activities on Delphi I by "IS" and "SHOULD BE." The profiles may be used to compare the similarity of the mean responses and the modal responses. Comparative analysis of variance between the Delphi probes is presented in Section VI of this chapter.

IV. ANALYSIS OF DATA FROM DELPHI PROBE II

Delphi Probe II was mailed to the jury of experts with the most frequently marked response identified on each of the sub-activities from Delphi Probe I. In addition, the response of each individual juror was indicated by a red "x" if it was different from the most frequently marked response. The jurors who held responses different from the most frequently marked response and who wished to maintain the response indicated by the red "x" were asked to give reasons for maintaining the response. If the juror decided that no reason existed for maintaining the original response, another choice was made. The juror then circled the most frequent response marked on Delphi Probe I or selected another rating on the five-point scale.

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[198] Uhl, op. cit., p. 11.

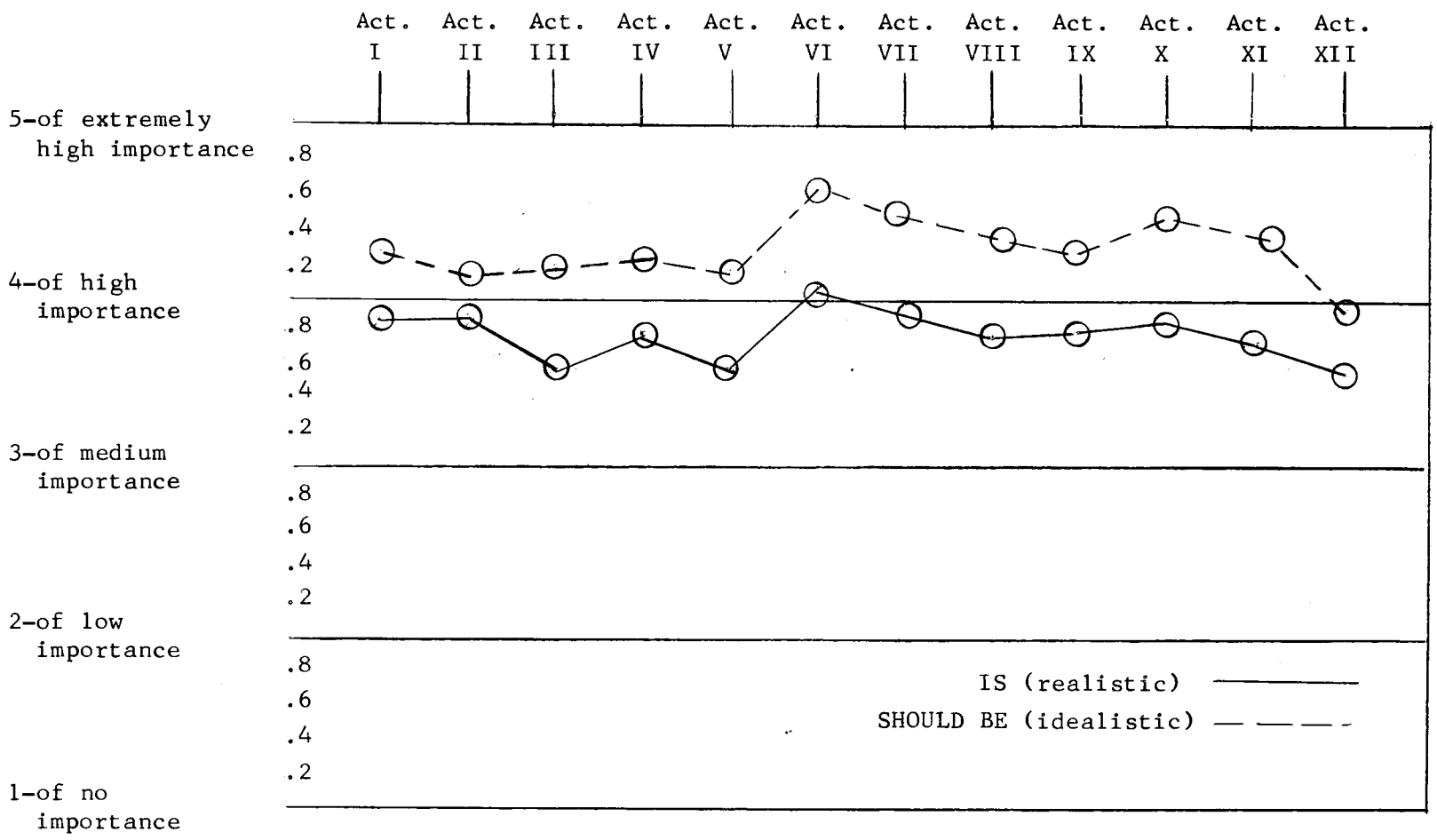


FIGURE 4. Profile of mean responses of the jury of experts by "IS" and "SHOULD BE."

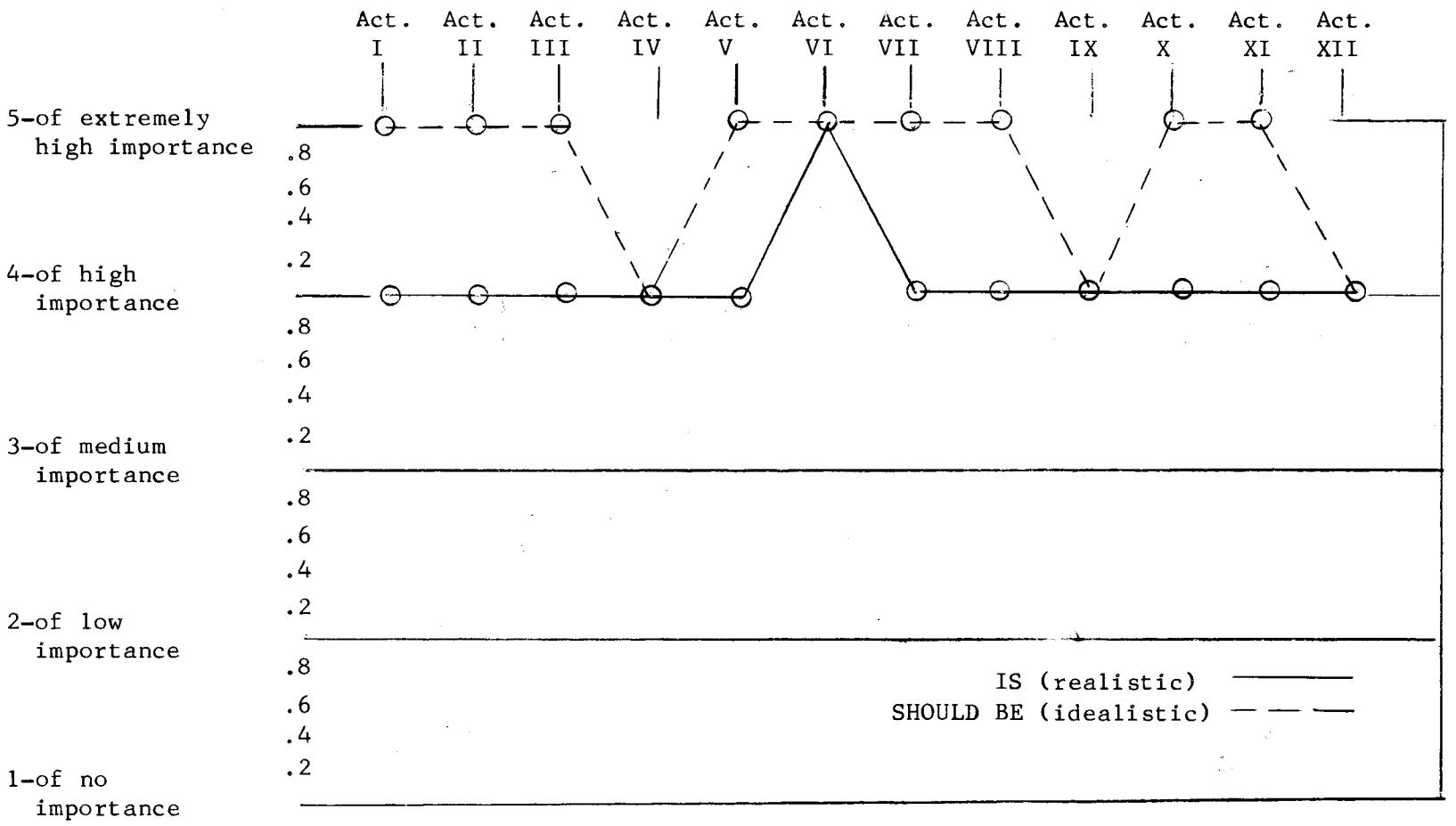


FIGURE 5. Profile of mode responses of the jury of experts by "IS" and "SHOULD BE."

Six new sub-activities were added as a result of recommendations of the jury during Delphi Probe I. On the Delphi II instrument, the new sub-activities were accompanied by rating scales similar to those provided on Delphi Probe I. The jurors were asked to mark the relative importance of the new sub-activities under "IS" (realistic) and "SHOULD BE" (idealistic) conditions on a five-point scale. Table 7 shows the results of the jurors' responses to the new sub-activities and the one sub-activity which did not have a rating scale provided on Delphi Probe I. Table 7 includes information concerning the mode, number marking the mode, mean, standard deviation and percent above 4.0 on the rating scale for the six new sub-activities and the sub-activity included without a scale on Delphi Probe I. The jury responses to the new activities indicated more variation than did the responses to the original activities when importance was rated. Standard deviations ranged from a low of .232 on sub-activity X-1 to a high of 1.538 on sub-activity III-2. Table 7 illustrates the differences in the rating of new sub-activities as compared to the original sub-activities. None of the remaining 41 sub-activities had standard deviations of 1.000 or higher under either the "IS" or "SHOULD BE" condition for Delphi Probe II.

The jury reacted to the revised master sequence chart (see Appendix H, Delphi Probe II) attached to Delphi Probe II. A request was made for the jury to review once again the sequencing of activities. They were provided a response mechanism (see Appendix H, Delphi Probe II) on which to record the recommendations. Table 8 provides information concerning recommendations of the jury, the number of jurors making the recommendations, and the percentage of agreement by "Properly Sequenced,"

TABLE 7

MODE, NUMBER MARKING THE MODAL RESPONSE, MEAN, STANDARD DEVIATION, AND PERCENT RATING THE SUB-ACTIVITY AT THE SCALE VALUE OF 4.0 OR ABOVE BY "IS" AND "SHOULD BE" (N=36)

Sub-Activity	IS					SHOULD BE				
	Mode	No. Marking Response	Mean	Standard Deviation	Percent of Rating 4.0 & Above	Mode	No. Marking Response	Mean	Standard Deviation	Percent of Rating 4.0 & Above
Sub-Act. I-3	4.000	20	3.556	1.275	69.4	4.000	22	3.722	1.301	80.6
Sub-Act. III-2	4.000	25	3.583	1.360	80.6	5.000	19	4.083	1.538	88.9
Sub-Act. VI-5 (a)	4.000	27	3.806	1.037	86.1	5.000	17	4.222	1.174	91.7
Sub-Act. VIII-3	4.000	29	3.750	.996	86.1	5.000	19	4.278	1.186	91.7
Sub-Act. VIII-4	4.000	18	3.389	1.202	58.3 (b)	5.000	16	3.972	1.404	80.6
Sub-Act. IX-4	4.000	21	3.361	1.150	61.1 (c)	4.000	15	3.917	1.381	80.6
Sub-Act. X-1	4.000	24	3.889	1.090	86.1	5.000	26	4.944	.232	100.0

(a) Sub-activity with rating scale omitted on Delphi Probe I.

(b) 88.9 percent rated 3.0 or above.

(c) 88.9 percent rated 3.0 or above.

TABLE 8

SEQUENCING RESPONSES MADE BY THE JURY OF EXPERTS, DELPHI PROBE II, BY NUMBER OF RESPONDENTS, PERCENTAGE OF RESPONDENTS BY CATEGORY AND BY ACTIVITY (N=36)

Activity No.	PROPERLY SEQUENCED		IMPROPERLY SEQUENCED		Non-Respondents	Percent Non-Responses
	No. of Respondents	Percent Agreement	No. of Respondents	Percent Agreement		
I	36	100.0	-	-	-	-
II	35	97.2	1	2.8	-	-
III	34	94.4	1	2.8	1	2.8
IV	35	97.2	1	2.8	-	-
V	35	97.2	1	2.8	-	-
VI	36	100.0	-	-	-	-
VII	36	100.0	1	2.8	-	-
VIII	35	97.2	1	2.8	-	-
IX	36	100.0	1	-	-	-
X	35	97.2	1	2.8	-	-
XI	35	97.2	-	-	1	2.8
XII	35	97.2	-	-	1	2.8
TOTALS	423	98.0	6	1.4	3	.6

"Improperly Sequenced," and "Non-Response." An overall concurrence of 98.0 percent was obtained for the proper sequencing of activities during the administration of Delphi Probe II.

The decision was made to discontinue further use of the jury for the sequencing of activities due to the high percentage of concurrence.

The criteria for inclusion and exclusion of sub-activities for developing Delphi Probe III were applied to the data obtained from responses by the jurors on Delphi Probe II. Table 9 provides the data used in conjunction with the criteria for determining inclusion or exclusion of sub-activities for Delphi Probe III. The percent responding at the scale value of 4.0 or higher is indicated in Table 9. The 4.0 scale rating was one point higher than the criterion of 3.0 used to determine the inclusion of sub-activities for Delphi Probe III.

Delphi Probe II contained a response mechanism provided for the jury of experts to write reasons for maintaining positions either above (+) or below (-) the response most frequently made on Delphi Probe I. The jurors made 333 remarks to maintain ratings which differed from the most frequent response on Delphi Probe I. (See Appendix J, Attachment B for a complete listing.) One-hundred and sixty-six reasons were written by jurors who maintained ratings above (+) the scale values marked most frequently on Delphi Probe I. One-hundred and seventy-seven reasons were written by jurors who marked scale values below (-) the most frequently marked values on Delphi Probe I. The changes in mode ratings were slight between Delphi Probe I and Delphi Probe II. The mean responses were closer together on Delphi Probe II than illustrated

TABLE 9

MODE, NUMBER OF RESPONDENTS REPRESENTING THE MODE, MEAN, STANDARD DEVIATION, PERCENT OF RESPONSES ABOVE 4.0 BY "IS" AND "SHOULD BE" AND BY SUB-ACTIVITY FOR DELPHI PROBE II (N=36)

Activity and Sub-Activity	IS					SHOULD BE				
	Mode	No. of Responses on Mode	Mean	Standard Deviation	Percent of Responses 4.0 & Above	Mode	No. of Responses on Mode	Mean	Standard Deviation	Percent of Responses 4.0 & Above
ACTIVITY I										
Sub-Act. I-1	4.000	30	3.861	.487	86.1	5.000	29	4.694	.710	91.7
Sub-Act. I-2	4.000	29	4.028	.446	91.7	4.000	28	4.167	.447	97.2
Sub-Act. I-3	4.000	20	3.556	1.275	69.4	4.000	22	3.722	1.301	80.6
Sub-Act. I-4	4.000	35	3.972	.167	97.2	5.000	28	4.694	.624	91.7
ACTIVITY II										
Sub-Act. II-1	4.000	33	3.972	.291	94.6	5.000	31	4.778	.637	94.6
Sub-Act. II-2	4.000	29	3.917	.604	88.9	4.000	28	3.944	.475	86.1
Sub-Act. II-3	4.000	28	3.833	.775	86.1	5.000	31	4.861	.351	100.0
ACTIVITY III										
Sub-Act. III-1	4.000	27	4.028	.696	91.7	5.000	32	4.889	.319	100.0
Sub-Act. III-2	4.000	25	3.583	1.360	80.6	5.000	19	4.083	1.538	88.9
Sub-Act. III-3	5.000	28	4.667	.676	88.9	5.000	34	4.944	.232	100.0
Sub-Act. III-4	4.000	28	4.111	.465	94.4	5.000	33	4.917	.280	100.0
Sub-Act. III-5	4.000	29	4.083	.439	94.4	5.000	33	4.917	.280	100.0
Sub-Act. III-6	4.000	33	4.083	.280	100.0	4.000	27	4.250	.439	100.0
ACTIVITY IV										
Sub-Act. IV-1	4.000	28	3.972	.560	88.9	5.000	28	4.750	.500	97.2
Sub-Act. IV-2	4.000	31	4.056	.475	97.2	5.000	35	4.972	.167	100.0
Sub-Act. IV-3	3.000	29	3.139	.593	13.9 (a)	5.000	23	4.333	.986	75.0
Sub-Act. IV-4	4.000	32	3.944	.333	91.7	4.000	33	4.028	.291	97.2
ACTIVITY V										
Sub-Act. V-1	4.000	31	3.889	.465	88.9	4.000	30	4.056	.410	94.6
Sub-Act. V-2	4.000	32	3.861	.424	88.9	4.000	31	3.972	.377	91.7
Sub-Act. V-3	4.000	31	4.028	.377	94.4	4.000	26	4.167	.507	94.4

TABLE 9 (continued)

Activity and Sub-Activity	IS					SHOULD BE				
	Mode	No. of Responses on Mode	Mean	Standard Deviation	Percent of Responses 4.0 & Above	Mode	No. of Responses on Mode	Mean	Standard Deviation	Percent of Responses 4.0 & Above
ACTIVITY VI										
Sub-Act. VI-1	4.000	29	4.028	.446	91.7	4.000	25	4.139	.543	91.7
Sub-Act. VI-2	4.000	28	3.917	.554	86.1	5.000	27	4.649	.683	88.9
Sub-Act. VI-3	4.000	25	3.750	.649	75.5	5.000	24	4.417	.937	80.6
Sub-Act. VI-4	3.000	27	3.194	.624	19.5 (b)	5.000	25	4.583	.732	91.7
Sub-Act. VI-5	4.000	27	3.806	1.037	86.1	5.000	17	4.222	1.174	91.7
ACTIVITY VII										
Sub-Act. VII-1	4.000	33	3.806	.668	91.7	5.000	32	4.861	.424	97.2
Sub-Act. VII-2	4.000	31	4.056	.475	97.2	5.000	34	4.917	.368	97.2
Sub-Act. VII-3	5.000	32	4.861	.424	97.2	5.000	36	5.000	-	100.0
Sub-Act. VII-4	4.000	33	3.972	.291	94.4	4.000	28	4.222	.422	100.0
ACTIVITY VIII										
Sub-Act. VIII-1	4.000	31	3.917	.368	88.9	5.000	31	4.833	.447	97.2
Sub-Act. VIII-2	4.000	34	3.917	.368	94.4	5.000	32	4.806	.624	94.4
Sub-Act. VIII-3	4.000	29	3.750	.996	86.1	5.000	19	4.278	1.186	91.7
Sub-Act. VIII-4	4.000	18	3.389	1.202	58.3 (c)	5.000	16	3.972	1.404	80.6
ACTIVITY IX										
Sub-Act. IX-1	4.000	34	3.917	.368	94.4	5.000	31	4.861	.351	100.0
Sub-Act. IX-2	4.000	34	3.944	.232	94.4	4.000	33	4.028	.291	97.2
Sub-Act. IX-3	4.000	32	3.944	.333	91.7	5.000	30	4.806	.467	97.2
Sub-Act. IX-4	4.000	21	3.361	1.150	61.1 (d)	4.000	15	3.917	1.381	80.6
ACTIVITY X										
Sub-Act. X-1	4.000	24	3.889	1.090	68.1	5.000	26	4.472	1.207	91.7
Sub-Act. X-2	4.000	26	3.972	.609	86.1	5.000	34	4.944	.232	100.0
Sub-Act. X-3	4.000	31	3.944	.475	91.7	4.000	28	4.222	.422	100.0

TABLE 9 (continued)

Activity and Sub-Activity	IS					SHOULD BE				
	Mode	No. of Responses on Mode	Mean	Standard Deviation	Percent of Responses 4.0 & Above	Mode	No. of Responses on Mode	Mean	Standard Deviation	Percent of Responses 4.0 & Above
ACTIVITY XI										
Sub-Act. XI-1	4.000	32	3.917	.439	91.7	5.000	32	4.833	.507	94.4
Sub-Act. XI-2	4.000	29	4.028	.446	91.7	4.000	25	4.194	.525	94.4
Sub-Act. XI-3	4.000	28	3.806	.889	86.1	4.000	25	4.056	.860	91.7
Sub-Act. XI-4	4.000	29	3.778	.760	83.3	5.000	28	4.611	.964	91.7
ACTIVITY XII										
Sub-Act. XII-1	4.000	30	3.833	.941	91.7	4.000	29	3.944	.924	94.4
Sub-Act. XII-2	3.000	24	3.139	.899	25.0 (e)	4.000	26	3.972	.971	91.7
Sub-Act. XII-3	4.000	28	3.944	.860	91.7	4.000	29	4.000	.793	94.4

(a) 94.4 percent above 3.0.

(b) 94.4 percent above 3.0.

(c) 88.9 percent above 3.0.

(d) 88.9 percent above 3.0.

(e) 91.7 percent above 3.0.

in Figure 4, page 160, for Delphi Probe I. Figure 6 illustrates the profile of the mean responses by activity and by "IS" and "SHOULD BE" conditions for Delphi Probe II. A comparison of Figure 4, page 160, and Figure 6 illustrates the convergence of the means between Delphi Probe I and Delphi Probe II. Table 10 provides specific information concerning the mode, means, and standard deviations used to develop Figure 6. A presentation of tables and a discussion of convergence of opinion is included in Section VI of this chapter.

V. ANALYSIS OF DATA FROM DELPHI PROBE III

Delphi Probe III was designed to obtain a rating of importance for each sub-activity under the "IS" (realistic) and "SHOULD BE" (idealistic) conditions. The jury was provided the comments (see Appendix J, Attachment B) made during Delphi Probe II of those jurors who maintained a position other than the one most frequently marked. The comments were organized into two divisions, "IS" and "SHOULD BE," and were further sub-divided by each sub-activity in categories which represented comments made by jurors who maintained scale responses above (+) and below (-) the most frequently marked responses on Delphi Probe II. The comments represented the minority opinions and were provided to the jurors as a basis for the ratings on Delphi Probe III. Each modal response from Delphi Probe II was indicated on this instrument so that jurors would have a reference point for marking the relative importance of each sub-activity. Sequencing was completed after analysis of Delphi Probe II was finished. The master sequencing chart was provided to the jury of experts as Attachment A for reference purposes only. The jury

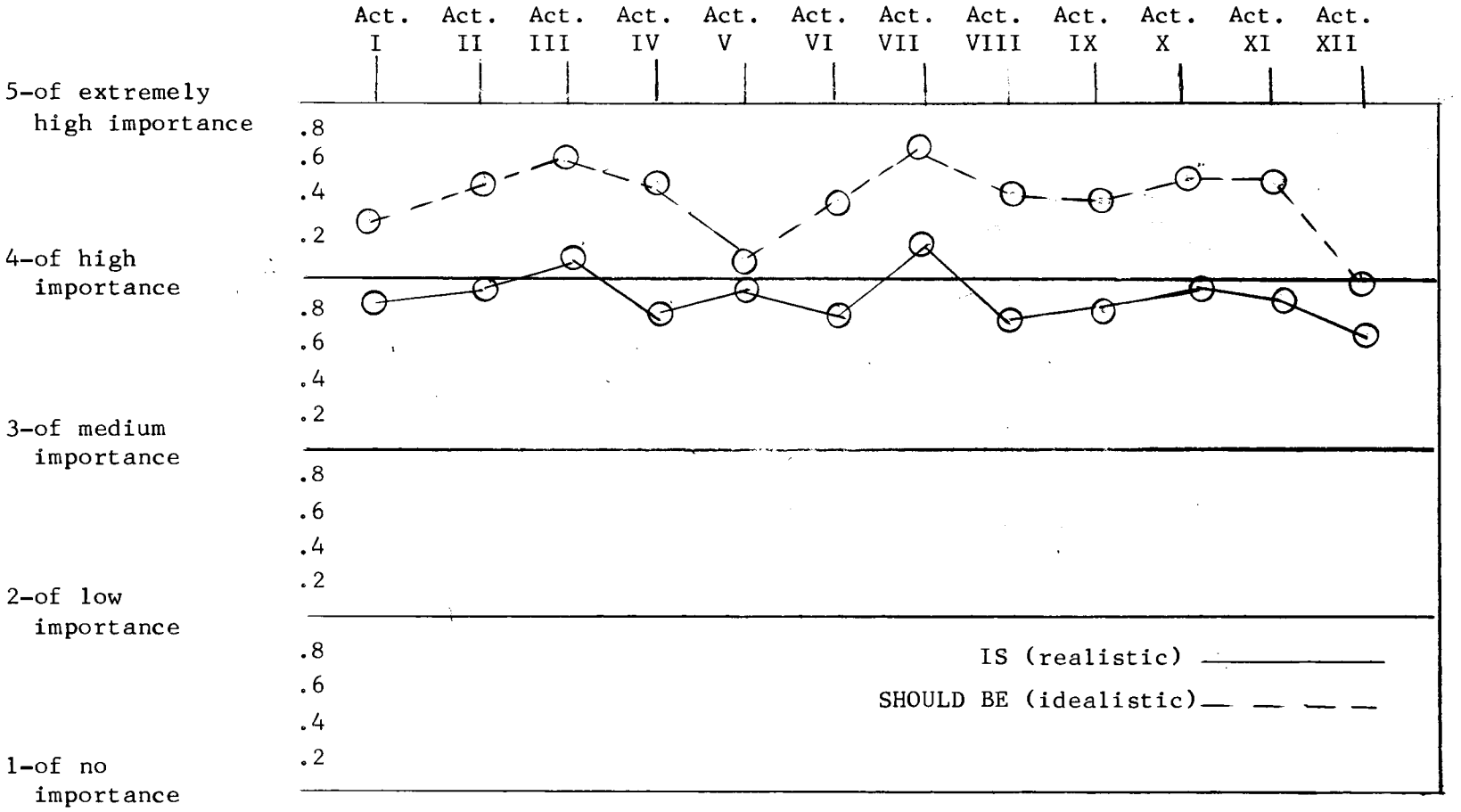


FIGURE 6. Profile of mean response of the jury of experts on Delphi Probe II by activity and by "IS" and "SHOULD BE."

TABLE 10

MODES, MEANS, AND STANDARD DEVIATIONS FOR DELPHI PROBE II

Activity	Mode	Mean	Standard Deviation
I	4.000	4.086	.682
II	4.000	4.217	.522
III	5.000	4.380	.584
IV	4.000	4.149	.488
V	4.000	3.996	.427
VI	4.000	4.070	.738
VII	5.000	4.462	.439
VIII	4.000	4.108	.824
IX	4.000	4.097	.571
X	4.000	4.241	.673
XI	4.000	4.153	.674
XII	4.000	3.805	.898

of experts were provided an opportunity to make final comments on response mechanisms at the end of each sub-activity. Fifteen comments were made, twelve of which were judged positive and supportive of the sub-activities. Three of the comments were classified as negative.

Table 11 provides information concerning modal responses, number of jurors who marked the scale value representing the mode, the mean, the standard deviation, and the percentage of jurors marking the scale of relative importance at the 4.0 (of high importance) level and above. As in previous probes, the information was presented in the categories of "IS" and "SHOULD BE." Concurrence at the 4.0 scale value was less than 85 percent on only four of the 47 sub-activities. All four, however, had ratings above the criterion of inclusion which was set at 3.0 (of medium importance). Considerable convergence was obtained during Delphi Probe III. Figure 7 provides a profile of the means of "IS" and "SHOULD BE" by activity. When comparisons of Figure 7 were made to Figures 4, page 160, and Figure 6, page 170, convergence of the mean was more evident than a similar comparison of numerical values. Table 12 provides the source of information used to develop Figure 7. Table 12 includes information concerning the mode, mean, and standard deviation by activity and by "IS' (realistic) and "SHOULD BE" (idealistic) categories from Delphi Probe III.

A range with a low of twenty-one jurors and a high of thirty-five jurors responded at the mode level on the various sub-activities of Delphi Probe III. Sixty-six of the 94 modal responses reported in Table 12 reflected responses of 30 or more of the jurors. Another 23 sub-activities contained mode responses consisting of 25 to 29 of the

TABLE 11

MODE, NUMBER OF RESPONDENTS REPRESENTING THE MODE, MEAN, STANDARD DEVIATION, PERCENT OF RESPONSES ABOVE 4.0 BY "IS" AND "SHOULD BE" AND BY SUB-ACTIVITY FOR DELPHI PROBE III (N=35)

Activity and Sub-Activity	IS					SHOULD BE				
	Mode	No. of Responses on Mode	Mean	Standard Deviation	Percent of Responses 4.0 & Above	Mode	No. of Responses on Mode	Mean	Standard Deviation	Percent of Responses 4.0 & Above
ACTIVITY I										
Sub-Act. I-1	4.000	31	4.000	.250	97.1	5.000	28	4.788	.545	94.3
Sub-Act. I-2	4.000	30	4.091	.292	100.0	4.000	29	4.121	.331	100.0
Sub-Act. I-3	4.000	30	4.000	.433	97.1	4.000	31	3.970	.394	97.1
Sub-Act. I-4	4.000	32	4.030	.174	100.0	5.000	29	4.818	.528	94.3
ACTIVITY II										
Sub-Act. II-1	4.000	31	4.061	.242	100.0	5.000	30	4.909	.292	100.0
Sub-Act. II-2	4.000	33	3.939	.348	97.1	4.000	33	3.970	.174	97.1
Sub-Act. II-3	4.000	24	4.152	.566	91.4	5.000	31	4.939	.242	100.0
ACTIVITY III										
Sub-Act. III-1	4.000	26	4.121	.485	94.3	5.000	31	4.939	.242	100.0
Sub-Act. III-2	4.000	32	4.000	.250	97.1	5.000	29	4.879	.331	100.0
Sub-Act. III-3	5.000	31	4.909	.292	100.0	5.000	35	5.000	0.0	100.0
Sub-Act. III-4	4.000	28	4.152	.442	97.1	5.000	31	4.939	.242	100.0
Sub-Act. III-5	4.000	28	4.212	.415	100.0	5.000	32	4.939	.214	100.0
Sub-Act. III-6	4.000	31	4.091	.292	100.0	4.000	24	4.303	.467	100.0
ACTIVITY IV										
Sub-Act. IV-1	4.000	29	4.030	.394	94.3	5.000	27	4.788	.415	100.0
Sub-Act. IV-2	4.000	31	4.061	.242	100.0	5.000	30	4.879	.331	100.0
Sub-Act. IV-3	3.000	27	3.182	.392	22.9 (a)	5.000	24	4.545	.711	88.6
Sub-Act. IV-4	4.000	30	3.909	.292	91.4	4.000	31	4.000	.250	97.1
ACTIVITY V										
Sub-Act. V-1	4.000	31	4.000	.250	97.1	4.000	32	4.061	.214	100.0
Sub-Act. V-2	4.000	34	4.000	.086	100.0	4.000	34	4.000	.077	100.0
Sub-Act. V-3	4.000	32	4.030	.174	100.0	4.000	35	4.091	0.0	100.0

TABLE 11 (continued)

Activity and Sub-Activity	IS					SHOULD BE				
	Mode	No. of Responses on Mode	Mean	Standard Deviation	Percent of Responses 4.0 & Above	Mode	No. of Responses on Mode	Mean	Standard Deviation	Percent of Responses 4.0 & Above
ACTIVITY VI										
Sub-Act. VI-1	4.000	30	4.061	.242	100.0	4.000	31	4.091	.174	100.0
Sub-Act. VI-2	4.000	30	4.091	.292	100.0	5.000	27	4.818	.392	100.0
Sub-Act. VI-3	4.000	28	3.939	.496	91.4	5.000	26	4.697	.684	94.3
Sub-Act. VI-4	3.000	25	3.242	.435	28.6 (b)	5.000	21	4.606	.556	97.1
Sub-Act. VI-5	4.000	33	4.030	.129	100.0	5.000	30	4.909	.292	100.0
ACTIVITY VII										
Sub-Act. VII-1	4.000	30	3.939	.348	91.4	5.000	31	4.879	.415	97.1
Sub-Act. VII-2	4.000	29	4.091	.384	97.1	5.000	35	5.000	0.0	100.0
Sub-Act. VII-3	5.000	28	4.848	.364	100.0	5.000	34	4.970	.086	100.0
Sub-Act. VII-4	4.000	35	4.000	0.0	100.0	5.000	31	4.939	.242	100.0
ACTIVITY VIII										
Sub-Act. VIII-1	4.000	31	3.970	.305	94.3	5.000	30	4.879	.331	100.0
Sub-Act. VIII-2	4.000	35	4.000	0.0	100.0	5.000	31	4.909	.292	100.0
Sub-Act. VIII-3	4.000	33	4.030	.174	100.0	5.000	33	4.970	.174	100.0
Sub-Act. VIII-4	4.000	29	3.848	.619	88.6	5.000	28	4.758	.751	97.1
ACTIVITY IX										
Sub-Act. IX-1	4.000	32	4.030	.174	100.0	5.000	31	4.909	.292	100.0
Sub-Act. IX-2	4.000	32	3.970	.174	97.1	4.000	32	4.030	.174	100.0
Sub-Act. IX-3	4.000	34	4.000	.077	100.0	5.000	30	4.909	.292	100.0
Sub-Act. IX-4	4.000	30	3.909	.622	97.1	4.000	31	3.939	.556	97.1
ACTIVITY X										
Sub-Act. X-1	4.000	32	4.061	.242	100.0	5.000	33	4.970	.174	100.0
Sub-Act. X-2	4.000	29	4.121	.331	100.0	5.000	32	4.970	.174	100.0
Sub-Act. X-3	4.000	31	4.061	.242	100.0	4.000	28	4.152	.364	100.0

TABLE 11 (continued)

Activity and Sub-Activity	IS					SHOULD BE				
	Mode	No. of Responses on Mode	Mean	Standard Deviation	Percent of Responses 4.0 & Above	Mode	No. of Responses on Mode	Mean	Standard Deviation	Percent of Responses 4.0 & Above
ACTIVITY XI										
Sub-Act. XI-1	4.000	35	4.000	0.0	100.0	5.000	35	5.000	0.0	100.0
Sub-Act. XI-2	4.000	35	4.000	0.0	100.0	4.000	29	4.121	.331	100.0
Sub-Act. XI-3	4.000	32	4.030	.174	100.0	4.000	29	4.121	.331	100.0
Sub-Act. XI-4	4.000	31	4.000	.250	97.1	5.000	35	5.000	0.0	100.0
ACTIVITY XII										
Sub-Act. XII-1	4.000	31	4.061	.242	100.0	4.000	31	4.061	.242	100.0
Sub-Act. XII-2	3.000	27	3.212	.485	22.9 (c)	4.000	28	4.030	.394	94.3
Sub-Act. XII-3	4.000	32	4.061	.242	100.0	4.000	33	4.030	.174	100.0

(a) 100.0 percent responded 3.0 or above.

(b) 100.0 percent responded 3.0 or above.

(c) 100.0 percent responded 3.0 or above.

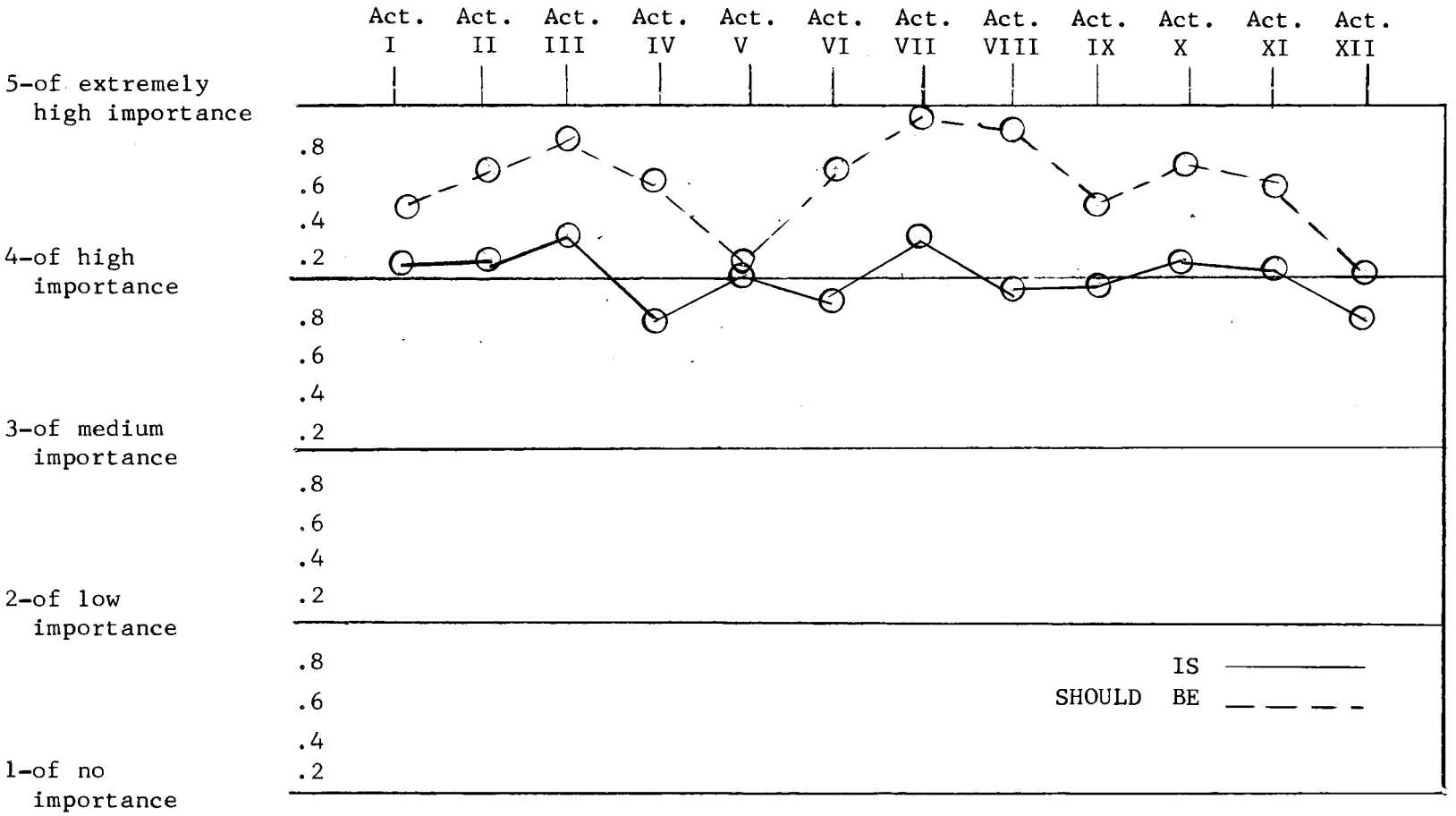


FIGURE 7. Profile of mean responses of the jury of experts on Delphi Probe III by activity and by "IS" and "SHOULD BE."

TABLE 12

MODES, MEANS, AND STANDARD DEVIATIONS FOR DELPHI PROBE III (N=35)

Activity	Mode	Mean	Standard Deviation
I	4.000	4.227	.368
II	4.000	4.328	.311
III	5.000	4.540	.335
IV	4.000	4.174	.378
V	4.000	4.031	.160
VI	4.000	4.248	.386
VII	5.000	4.583	.241
VIII	4.000	4.421	.331
IX	4.000	4.212	.273
X	4.000	4.389	.255
XI	4.000	4.284	.136
XII	4.000	3.909	.297

members of the jury of experts. Table 12 illustrates the degree of concurrence which resulted from Delphi Probe III.

VI. CONVERGENCE OF OPINION AS A RESULT OF DELPHI PROBES I, II, AND III

The Delphi technique was designed to encourage convergence of opinion and, at the same time, enhance individual input to the solution of a problem. This section of the analysis of data was developed to illustrate the degree of convergence of opinion which occurred through the administration of Delphi Probe I, II, and III. Forecasting the need for each activity and sub-activity to be included in the Phase II Activity Model and determining its relative importance was a demonstrated function of the convergence of opinion of the jury of experts.

Convergence of opinion was studied and was reported in terms of the mean response of each activity and the variance of the responses. Table 13 provides information concerning the mean responses and variance of the responses for each Delphi probe by "IS" and "SHOULD BE." A high degree of convergence of opinion occurred as evidenced by the variances of Delphi Probe I as compared with variances for Delphi Probes II and III. Figure 8 provides a graphic illustration of the variance for each activity in Delphi Probe I as compared with Delphi Probe III. Few examples of data included in the study were as conclusive as the data regarding the convergence of opinion which occurred as illustrated in Figure 8. Table 13 provided the basic information for the development of Figure 8. Figure 8 shows that Activity II, Activity III, Activity V, Activity VII, Activity IX, Activity X, Activity XI, and Activity XII

TABLE 13

MEANS AND VARIANCES FOR DELPHI PROBES I, II, AND III BY ACTIVITY AND BY "IS" AND "SHOULD BE" WITHIN EACH ACTIVITY

	DELPHI PROBE I (N=36)		DELPHI PROBE II (N=36)		DELPHI PROBE III (N=36)	
Activity	Means	Variances	Means	Variances	Means	Variances
ACTIVITY I						
IS	3.833	.691	3.854	.353	4.030	.082
SHOULD BE	4.230	.511	4.319	.594	4.424	.202
Means & Variances	4.032	.598	4.086	.465	4.227	.135
ACTIVITY II						
IS	3.834	.982	3.907	.310	4.051	.148
SHOULD BE	4.139	1.002	4.528	.238	4.606	.056
Means & Variances	3.986	.992	4.217	.272	4.328	.097
ACTIVITY III						
IS	3.597	1.263	4.093	.426	4.248	.132
SHOULD BE	4.195	.964	4.667	.265	4.833	.094
Means & Variances	3.896	1.109	4.380	.341	4.540	.112
ACTIVITY IV						
IS	3.748	1.044	3.778	.240	3.796	.109
SHOULD BE	4.213	.712	4.521	.236	4.553	.182
Means & Variances	3.980	.870	4.149	.238	4.174	.143
ACTIVITY V						
IS	3.597	.878	3.926	.178	4.010	.020
SHOULD BE	4.132	.854	4.065	.186	4.051	.032
Means & Variances	3.864	.865	3.996	.182	4.031	.026

TABLE 13 (continued)

Activity	DELPHI PROBE I (N=36) Means	DELPHI PROBE I (N=36) Variances	DELPHI PROBE II (N=36) Means	DELPHI PROBE II (N=36) Variances	DELPHI PROBE III (N=36 Means	DELPHI PROBE III (N=36 Variances
ACTIVITY VI						
IS	4.022	1.014	3.739	.438	3.873	.108
SHOULD BE	4.606	.378	4.400	.663	4.624	.196
Means & Variances	4.313	.658	4.070	.547	4.248	.149
ACTIVITY VII						
IS	3.922	1.080	4.174	.216	4.220	.075
SHOULD BE	4.463	.581	4.750	.164	4.947	.043
Means & Variances	4.192	.810	4.462	.193	4.583	.058
ACTIVITY VIII						
IS	3.764	.850	3.743	.539	3.962	.076
SHOULD BE	4.334	.671	4.472	.837	4.879	.150
Means & Variances	4.049	.757	4.108	.679	4.421	.111
ACTIVITY IX						
IS	3.787	1.049	3.792	.271	3.977	.048
SHOULD BE	4.241	.839	4.403	.388	4.447	.108
Means & Variances	4.013	.941	4.097	.326	4.212	.075
ACTIVITY X						
IS	3.818	1.134	3.935	.526	4.081	.074
SHOULD BE	4.431	.921	4.546	.384	4.697	.056
Means & Variances	4.125	10.24	4.241	.453	4.389	.065
ACTIVITY XI						
IS	3.715	1.254	3.882	.402	4.008	.011
SHOULD BE	4.333	.719	4.424	.510	4.561	.028
Means & Variances	4.024	.956	4.153	.454	4.284	.018

TABLE 13 (continued)

Activity	DELPHI PROBE I (N=36) Means	DELPHI PROBE I (N=36) Variances	DELPHI PROBE II (N=36) Means	DELPHI PROBE II (N=36) Variances	DELPHI PROBE III (N=36) Means	DELPHI PROBE III (N=36) Variances
ACTIVITY XII						
IS	3.546	1.061	3.639	.810	3.778	.104
SHOULD BE	3.981	.910	3.972	.802	4.040	.073
Means & Variances	3.764	.984	3.805	.806	3.909	.088

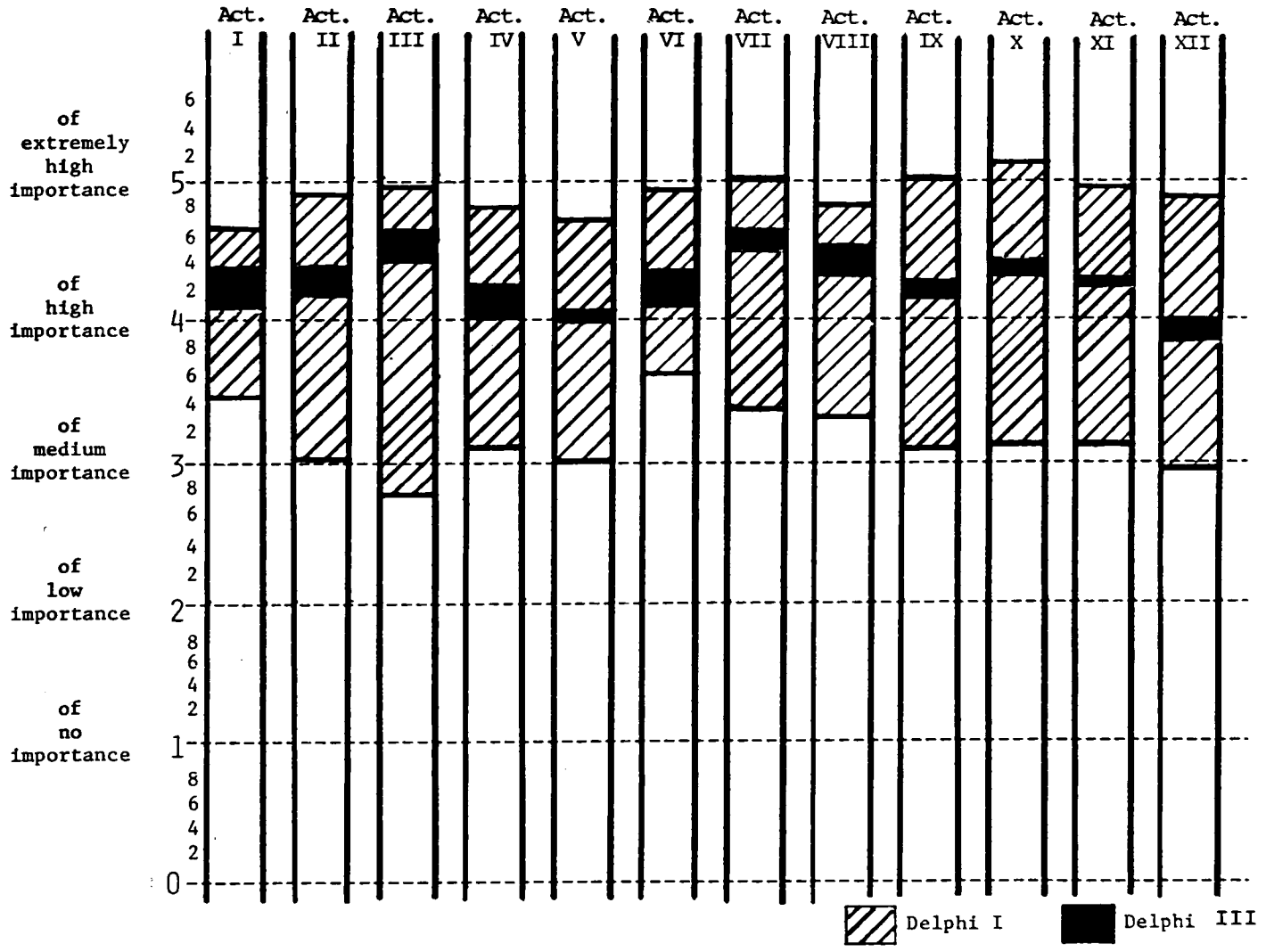


FIGURE 8. Jury of experts response variance for Delphi I and III by activity.

contained the greatest variance; yet the same activities contained the least amount of proportional variance after administration of Delphi Probe III. Figure 9 explains the sources of this change in variance and includes variance by activity and by "IS" and "SHOULD BE" for Delphi Probe I and Delphi Probe III. An observation of the activities which contained the greatest variance on Delphi Probe I and the smallest variance on Delphi Probe III suggests that the change in variance was primarily the result of higher convergence of opinion by the jury of experts on the "SHOULD BE" aspects of the rating scales. Figures 8 and 9 illustrate the effect of convergence and, in particular, the effect of feedback of minority opinions during Delphi Probe III.

Further evidence of the occurrence of convergence of opinion was provided by data included in Table 14. Table 14 provides data concerning the variance and the Alpha Coefficients of reliability, for each activity for Delphi Probes I, II, and III.

The variance declined for each activity from Delphi Probe I through Delphi Probe III. The reliability of the probes in detecting the decline in variance decreased in the same manner as the Alpha Coefficients decreased. The phenomenon suggests that the probes accomplished the purposes for which they were designed; i.e., convergence of opinion. Figure 10 illustrates the proportional convergence of the variance and the decline in the Alpha Coefficients across the three probes.

Figure 11 illustrates the effect of the Delphi Technique used in the study on the decline of Alpha Coefficients of Reliability. The table provides a comparison concerning each Delphi probe, the range

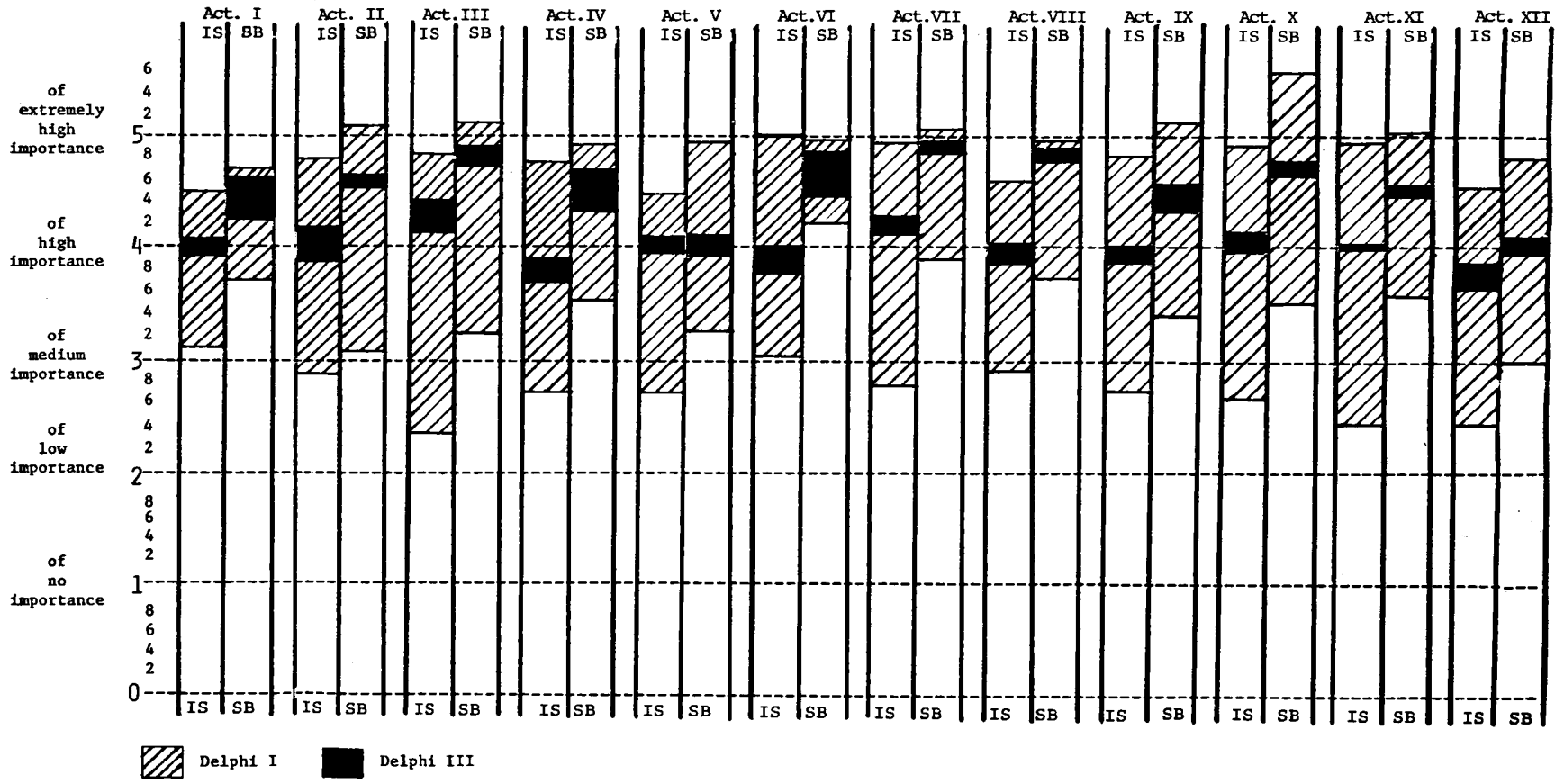


FIGURE 9. Jury of experts response variance for Delphi Probe I and III by activity and by "IS" and "SHOULD" within each activity.

TABLE 14

ALPHA COEFFICIENTS AND VARIANCES BY ACTIVITY FOR DELPHI PROBES I, II, AND III

Activity	DELPHI I		DELPHI II		DELPHI III	
	Variance	Alpha Coefficient	Variance	Alpha Coefficient	Variance	Alpha Coefficient
I	.598	.625	.465	.544	.135	.483
II	.992	.689	.272	.408	.097	.306
III	1.109	.805	.341	.633	.112	.628
IV	.870	.824	.238	.611	.143	.666
V	.865	.750	.182	.731	.026	.481
VI	.658	.824	.547	.744	.149	.389
VII	.810	.716	.193	.501	.058	.399
VIII	.757	.769	.678	.774	.111	.630
IX	.941	.838	.326	.553	.075	.605
X	1.024	.640	.453	.534	.065	.609
XI	.956	.822	.454	.837	.018	.723
XII	.984	.918	.806	.951	.088	.657
TOTAL INSTRUMENT VALUES	.874	.768	.393	.652	.084	.550

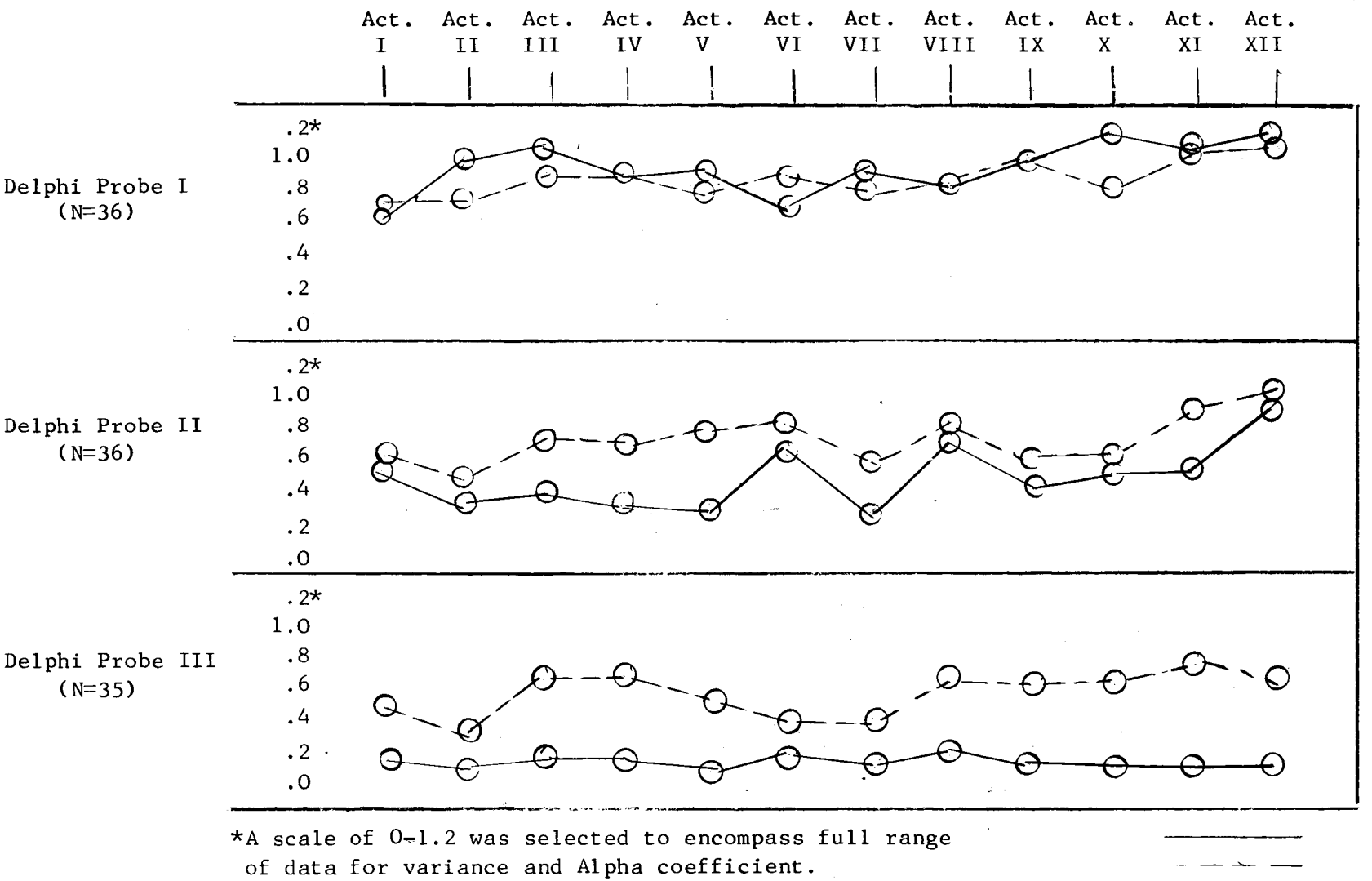
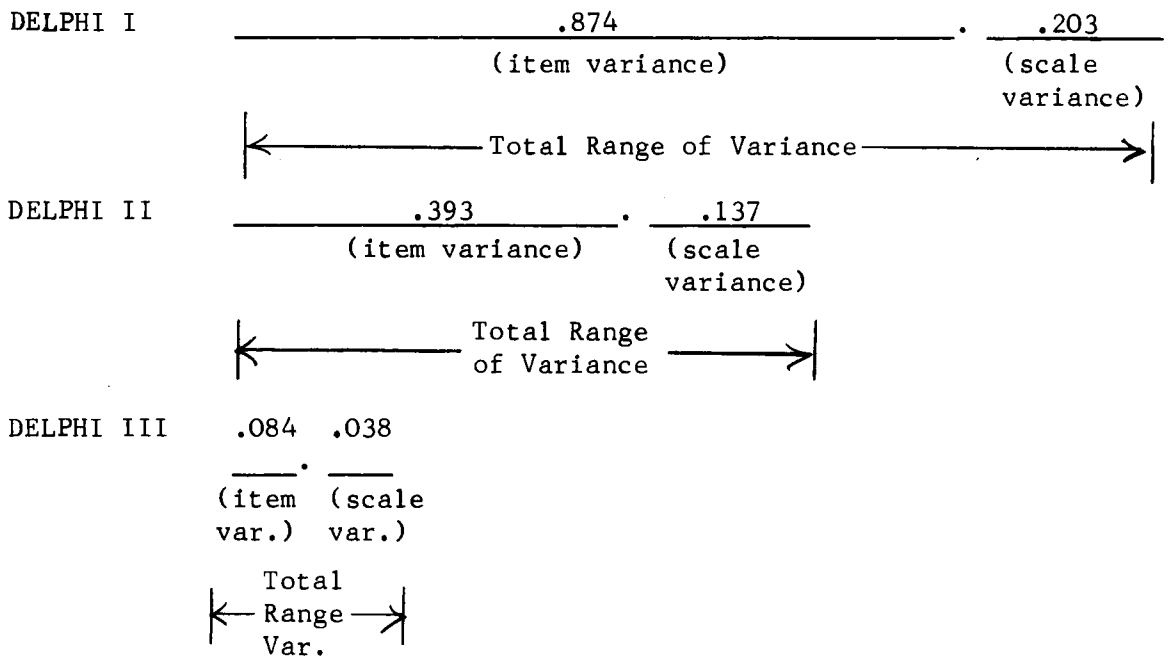


FIGURE 10. A profile of variance and Alpha internal consistency coefficients for Delphi probes I, II, and III.

of variance, item variance, error variance, and the formula used to calculate the Alpha Coefficients.

The convergence occurred and was reflected in the decrease of item variance through the three Delphi Probes. The jury responses were heterogeneous during Delphi I, became hetero-homogeneous during Delphi II, and were considered homogeneous (convergent) after Delphi III. These changes were attributed to the decrease in item variance between the probes while error variance (variance between jurors) remained relatively stable.



Calculations for Each Delphi Probe:

$ALPHA_{d1}$ = 1-.203/.874 = .768

d1 = Delphi I

$ALPHA_{d2}$ = 1-.137/.393 = .652

d2 = Delphi II

$ALPHA_{d3}$ = 1-.038/.084 = .550

d3 = Delphi III

Formula for the Alpha Coefficients:

$$ALPHA = \frac{n}{(n-1)} \left(1 - \frac{\leq V_i}{V_s}\right)$$

n = number of items in the scale

V_i = sum of the item variance

V_s = variance of scale scores

FIGURE 11. A graphic illustration of the range of variance, item variance, scale variance, formula and calculations for the Alpha coefficient for Delphi probes I, II, and III.

CHAPTER VI

SUMMARY, FINDINGS, AND RECOMMENDATIONS

The final chapter is divided into four sections. Section I contains a restatement of the problem and a summary of the procedures used. Section II contains the findings of the study in terms of the activity model developed as a result of the research. The conclusions are presented in Section III followed by the recommendations in Section IV.

I. SUMMARY OF PROCEDURES

The purpose of the study was to develop and validate an activity model for consideration of the Board of Directors of the Vocational-Technical Education Consortium of States. The procedures used to solve the problem included a preliminary review of related literature for the purposes of determining the state-of-the-art in the problem area. The preliminary review provided information concerning the scope of the problem, the need for the study, and definitions of terminology. A second review of literature and an in-depth study of selected projects resulted in the development of an a priori activity model for V-TECS and a master sequence chart which reflected the chronological order of the activities and sub-activities.

An important component of the study was on-site visits to ten project locations. During the visits, 31 persons were interviewed concerning the details of the projects. A contribution of the on-site

visits was the attainment of names of persons who were considered to be leaders and experts in the problem area. Following the visits, letters were written to project personnel and others requesting their participation in the study. Forty persons were identified and extended invitations to participate in the study. Thirty-eight of the forty who were contacted agreed to serve on the jury of experts for the study. The membership of the jury was reduced to thirty-six after the first Delphi probe because of one non-response and one unuseable response.

Delphi I was developed using instruments and procedures employed by Norman Uhl of the Educational Testing Service.[199] Subsequent Delphi probes were developed based upon comments, suggestions, and responses collected on the instruments used in the study. The data collected as a result of the three Delphi probes were electronically processed and analyzed by the use of prepared computer program packages (SPSS and sub-program reliability). The criteria for inclusion and exclusion of activities and sub-activities were applied prior to the development of Delphi Probes II and III. The criteria for selection cited on page 101 of this report were used as a basis for the final development of the activity model for the Vocational-Technical Education Consortium of States. The model is presented as Section II of this chapter.

II. FINDINGS OF THE STUDY

The major findings of the study were the 12 activities, 47 sub-activities, and master sequence chart of the Activity Model for the

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[199] Ibid.

Vocational-Technical Education Consortium of States. As a result of the criteria used for selection, the Activity Model is as follows:

THE PHASE II ACTIVITY MODEL

Activity Number I--Determination of Priorities and Assignment of Catalogs

This activity is the first step for developing catalogs of performance objectives and criterion-referenced measures. The activity has four basic sub-activities which form the rationale and consensus for catalog priority identification and assignment to the member states of V-TECS.

Sub-Activity I-1--State Priority Determination

The member states study data available to them concerning manpower needs, employment opportunities, and student interest surveys to establish a priority list within the state for catalogs of performance objectives and criterion-referenced measures. A state may consider regional and national data to determine its priorities or any other information which it deems necessary or appropriate.

Sub-Activity I-2--Consortium Priority Determination

The Board of Directors of V-TECS will discuss, in turn, the priorities established by each member state. The purpose of this structured discussion is to develop a priority listing from which the member states may select and be assigned a certain number of catalogs to develop. This sub-activity is to assure that duplication does not

occur and that a state has the opportunity to negotiate for specific catalogs in which it has a particular interest or for which considerable work has already been accomplished.

Sub-Activity I-3--Resolution of Conflict and Exchange of Previous Work Related to Catalogs to Be Developed

Should states not be able to resolve priority preference conflicts, a drawing of assignments will be conducted by the Board of Directors. In case a state does not get its desired priority area for reasons identified by the Board of Directors, a copy of such accomplished work would be provided to the state assigned the catalog area in dispute. This material will be included as an essential part of the state-of-the-art study to eliminate duplication of effort.

Sub-Activity I-4--Assignment and/or Selection of Catalogs

The Board of Directors makes the decisions concerning the final selection and/or assignment of catalogs after state and consortium priorities have been determined. Two primary considerations are given member states on the selection of a catalog:

(1) the state has a particular interest in a domain area;

(2) the state has accomplished or has in progress considerable work in a domain area which would benefit the Consortium.

Catalogs assigned by the Board of Directors of the Consortium are subject to acceptance by the state involved in the assignment.

Activity Number II--The Memorandum of Agreement

A Memorandum of Agreement is entered between the state selecting or being assigned a catalog to develop and the Consortium. The parties of the Memorandum of Agreement are the Chairman of the Board of Directors of V-TECS, the Executive Director of V-TECS, and the person designated by the State's Plan for Vocational Education as the State Director of Vocational Education. This activity has three sub-sctivities which must be completed prior to the developmental work on a catalog and they are as follows.

Sub-Activity II-1--Minimum Contents of the Memorandum of Agreement

The Memorandum of Agreement will be developed by the Consortium staff, and after a period of time, will be standardized. The Memorandum of Agreement will contain the following minimum items:

(1) date and name of catalog domain area including job titles to be surveyed

(2) designated signature blanks

(3) specific delivery dates for:

  (a) domain study and task lists

  (b) task analysis and survey results

  (c) catalog of performance objectives and criterion-referenced measures

  (d) field test period

  (e) final catalog and field test results

(4) responsibilities of a full-time technical coordinator in the state and to the Consortium

(5) Consortium staff involvement in the development of catalogs and the development of in-service training and dissemination plans.

Sub-Activity II-2--Processing the Memorandum of Agreement

The Memorandum of Agreement will take the following course for development and approval.

(1) format developed and prepared by the Consortium staff

(2) Memorandum of Agreement reviewed and signed by the Chairman of the Board of Directors and the Executive Director of V-TECS

(3) Memorandum of Agreement mailed to the states for review and signature by the State Director of Vocational-Technical Education

(4) designated copies distributed and project starts

(5) periodic PERT reports are mailed to states on request.

Sub-Activity II-3--Selection of a Project Director

Each state developing a catalog of performance objectives and criterion-referenced measures will select a person to serve as project director. The project director selects and manages writing teams which are composed of selected instructors in the domain being developed. These writing teams are trained by the project director and state technical coordinator to analyze the data resulting from the occupational analysis system, the findings of the state-of-the-art study, and other pertinent information. The project director is responsible for submitting to the state technical coordinator results of studies and analyses of data, catalogs of performance objectives and criterion-referenced

measures, and other products required by the Memorandum of Agreement. The project director will meet the same qualifications established by the Board of Directors of V-TECS for the technical coordinator in each state.

Activity Number III--Technical Preparation of V-TECS Staff and State Coordinators

The technical preparation and training of the Consortium staff and the technical coordinators in the states are paramount to maintaining quality control. A program of technical development will begin with an orientation to the model to insure that technical skills and knowledge are sufficiently developed to provide maximum quality control. This activity is divided into six sub-activities which form the basis for staff preparation and training and are as follows:

Sub-Activity III-1--System Orientation

A program designed to insure the performance of Consortium staff and technical coordinators will be administered. The orientation is in performance terms with each person satisfactorily completing the required tasks at a criterion-based performance level. Orientation to the system will not be considered complete until the performance standards are met by the Consortium staff and the technical coordinators.

Sub-Activity III-2--Determining Decision Criteria

The Board of Directors and the staff of V-TECS will develop the decision criteria to be used in the determination of tasks to be converted to performance objectives for cataloging. The decisions will be

based upon cut-off indices of time-spent, difficulty, criticality, and task perishability. Other bases for decision criteria may be developed by the Board of Directors based upon research of the data resulting from the surveys of the incumbent workers and their immediate supervisors.

Sub-Activity III-3--Interpretation of Task Analysis Data

An intensive training plan will guide the preparation of Consortium staff and personnel within the states to effectively utilize the data from the task analysis system. This training will assist personnel in the determination of index measures of tasks which are sufficiently high to use in a catalog. Optimum index rating scores will be developed when experience demonstrates that such a rating is feasible. Any tasks which fall below the desired index rating or combination of indice ratings will be excluded from conversion to performance objectives. Continuous training will be conducted for personnel as the task analysis system develops and the analysis of the research indicates a need for further training.

Sub-Activity III-4--Developing Skills in Writing Performance Objectives

Workshops, seminars, and conferences will focus on the development of skills needed to write performance objectives. Consortium staff and technical coordinators will be expected to demonstrate their ability to take a given set of task statements and data, then develop written performance objectives and criterion-referenced test items.

Sub-Activity III-5--Writing of Criterion-Referenced Test Items

Following the training of the staff and technical coordinators in the skills of writing performance objectives from task analysis data and task statements, intensive efforts will be introduced to develop companion criterion-referenced test items(s) for each performance objective. A task statement will yield one or more performance objectives and a performance objective will yield one or more criterion-referenced test items. Criterion-referenced test writing experts will serve as consultants for training Consortium staff and state technical coordinators. Personnel will either be sent to the source of technical expertise or the experts will be assembled in conference, seminar, or workshop settings.

Sub-Activity III-6--Monitoring and Quality Control of Personnel, Education, and Training

The Consortium staff and state technical coordinators will develop individual plans of technical preparation for themselves under guidelines developed by the Board of Directors of V-TECS. These plans would serve as a guide to insure minimum competence levels of personnel of the Consortium staff and within the states. The Executive Director of the Consortium has the ultimate responsibility for monitoring individual training programs of the Consortium staff and state technical coordinators in the states. The Board of Directors will receive at least a biennial status report of the technical preparation activities designed for individual Consortium staff and technical coordinators within the states. Reports of this nature may be requested any time the Board of Directors

desires to know the status of the total plan or individual progress of personnel.

Activity Number IV--Domain Study for Catalog Development

The domain study consists of thorough and organized research of what has been developed in performance objectives and criterion-referenced measures which might be appropriate and helpful during the development of a catalog. A domain consists of a broad instructional area (such as automotive mechanics) and should include appropriate job titles (e.g., automotive tune-up mechanic, service station mechanic, service station attendant, front end and brake mechanic, general automotive mechanic). Activity IV consists of at least four sub-activities.

Sub-Activity IV-1--State-of-the-Art Study

This activity increases the probability that Consortium projects will find material which has already been partially or fully developed by others in a domain area. The state-of-the-art study will include the following research activities as a part of the states' development of catalogs:

(1) a search of the ERIC system for germane information

(2) a search of the journal index of ERIC for germane articles

(3) inquiries to the U. S. Office of Education, National Center for Curriculum Development in Occupational Education

(4) selected inquiries to state departments of education for germane material

(5) inquiries to industry and private training institutions

(6) review of the Dissertation Abstract International Index

(7) inquiry to local education agencies identified as working on germane projects.

Sub-Activity IV-2--Task List Development

A comprehensive list of tasks performed by the incumbent workers will be developed as a part of the domain study. The task list will be based upon research completed in the state-of-the-art study (Sub-Activity IV-1) and, in addition, will include the following:

(1) a job structure arranged from the lowest job titles to the highest job title within a domain

(2) a coding system developed by the Consortium and identifed in the Dictionary of Occupational Titles will be applied to the job structure

(3) development of a task list using the following sources for obtaining task statements:

(a) review and observation of technical procedures used by workers

(b) identification of existing task lists or statements from technical manuals and germane literature

(c) interviews with incumbent workers and their immediate supervisors

(d) use of craft committees and selected committees of instructors to identify incumbent worker tasks

(e) provision of space for a survey of incumbent workers to add task statements not included on the list.

Sub-Activity IV-3--Development of Background Information

This part of the domain study will be used in conjunction with the task list to provide data which may be cross-tabulated and studied with the companion task lists. The background information section will include as a minimum:

(1) information about the incumbent worker and/or supervisor
    (a) name and address of incumbent worker
    (b) date survey complated by incumbent worker
    (c) job title or classification
    (d) years and months of experience in career field
    (e) years and months of experience in present job title or classification
    (f) previous vocational-technical training
    (g) private or public school attendance
    (h) highest grade level completed or GED equivalent
(2) information about job satisfaction
(3) information about utilization of talents and prior training
(4) list of equipment and tools used in the jobs of the domain
(5) type of work environment of the incumbent worker
(6) size of business or industry.

Sub-Activity IV-4--Reports of the Domain Study

The following reports will be required of the domain study activity:

(1) State-of-the-Art Study--This report includes the methods used to meet the requirements of Sub-Activity IV-1, (1), (2), and (3) of the model.

(2) Background Information and Task List--This report includes a comprehensive setion on background data to be completed by all incumbent workers who are surveyed. Following this section will be a comprehensive task listing which each incumbent worker will be asked to verify in his job classification. He will also be given the opportunity to add any task he is performing which is not included. The background information and task lists will be printed, in booklet form, in a standard format set by the Consortium staff and approved by the Board of Directors.

Activity Number V--Development and Implementation of the Domain Sampling Technique for the Task Statement Survey

The purpose of this activity is to obtain a sample of incumbent workers by a domain area and collect certain information from those sampled to be used later in a task analysis. Survey booklets of task statements are developed and printed using a standard format for the background and task statement information. The sampling design would be developed by an independent agency. This activity is divided into three sub-activities dealing with the sample design, sample administration, and processing of the survey results. Alternative procedures are included as a part of Sub-Activity V-1 and Sub-Activity V-2.

Sub-Activity V-1--Design of the Sample

(a) Optimum sample design--The optimum sample design consists of administration of the task statement survey to stratified random sampling of incumbent workers holding a job classified within the domain. The

base data is to be used in determining the sample size will be the occupational information (coded from the Dictionary of Occupational Titles) collected during the 1970 Census of the United States. The body of the information collected will be statistically analyzed with inferences made to the population. (All workers in the United States in a given job classification within a specific domain.)

(b) Alternative sample design #1--The alternative sample design #1 collects information using the same base data as in V-1 (a) but limits the sample to the member states of the Consortium and makes no inferences beyond those states not included in the survey.

(c) Alternative sample design #2--The alternative sample design #2 collects information using the same base data as in V-1 (a) but limits the sample to the state which is developing a task survey in a particular domain. A purposive sample could be used by any state desiring to validate task lists within a state not included in the survey.

Sub-Activity V-2--Administration of the Occupational Analysis Survey

(a) Optimum administration--The optimum administration of the survey would be conducted through a central staff in the Consortium office. This would permit control of the follow-up letters, follow-up telephone calls, and general sequence timing of the surveys. Limitations exist in the application of the optimum administration which are proportionate to the activities selected in Sub-Activity V-1.

(b) Alternate administration--An alternative method of administration would be to have each state which develops the task statement lists also conduct the survey of incumbent workers based upon the

selection of the sample design in Sub-Activity V-1. This method is based upon a thorough development of a sampling administration criteria which will be used in the survey efforts. A sub-sample will be selected and individually interviewed on the work site to compare with the results of the mail-out survey.

Sub-Activity V-3--Processing the Survey Results

The results of the survey will be keypunched or optically scanned and computerized. Various analyses will be made of the data to make decisions about tasks performed by incumbent workers. These survey results will provide the basis for writing performance objectives and criterion-referenced test items. Indices of time-spent, difficulty, criticality, and perishability will provide the basis for strategic decision making. The analysis will be accomplished by using computer programs designed by the U. S. Air Force for this purpose.

Activity Number VI--Occupational Analysis System

The backbone of the Phase II Model is the system used to develop scientific task analysis information based upon a direct survey of incumbent workers. This effort should affect the quality, realism, and scope of the catalogs of performance objectives. The basic source document for the task analysis system is the task statement survey and background information collected from the incumbent worker. Activity Number VI has five basic sub-activities which make up the system of task analysis. These sub-activities have to do with computed indices of task time-spent, task difficulty, task criticality, task perishability, and computer analysis and reporting.

Sub-Activity VI-1--Task Time-Spent Index

The incumbent workers complete the background information and check the tasks they actually perform in the task statement booklet. After checking the task statement, the incumbent worker rates the relative amount of time spent on the task along a seven-point scale. The response on the scale is converted to a time-spent index based on percentages over the total group of task statements checked. The resulting percentage figure is cumulative to 100 percent on all tasks checked. This conversion of information and calculations is accomplished by use of a computer.

Sub-Activity VI-2--Task Criticality Index

The incumbent worker rates a task in terms of its critical performance. The primary interest of this part of the task analysis is to ascertain by use of a seven-point scale the relative critical values of each task. When obtained, the index of criticality can be applied to the development of performance objectives. A thorough review of this critical index will identify the tasks which are most critical in descending order to those which are considered least critical. On the basis of these data, determination can be made regarding the consequences of a poor performance of the critical tasks.

Sub-Activity VI-3--Task Difficulty Index

The same process is used to calculate an index of task difficulty which is used in the determination of the time-spent index. A seven-point scale is again employed to determine the incumbent worker's perception of task difficulty. One additional step is included to

determine the task difficulty index. The task statement survey is also administered to the immediate supervisor of the incumbent worker. The responses are then correlated, and the resulting figure becomes the difficulty index.

Sub-Activity VI-4--Task Perishability Index

The same sampling technique and incumbent workers are used to obtain a perishability index. This index is a measure, on a seven-point scale, of the relative perishability of a task statement currently being performed by the incumbent workers participating in the survey. This index will relate to the need for retraining or refresher courses should the worker not perform, on a continuous basis, those tasks which are rated to have high indices of perishability. One implication of this type of index is to provide guidance for development of self-paced instructional packages which have as a basis the tasks which have the higher perishability indices. Retraining and development of materials could be minimized by including objectives for tasks which have high indices of perishability.

Sub-Activity VI-5--Processing of Data and Development of Reports

The information collected from Sub-Activity VI-1, VI-2, VI-3, and VI-4 will be computerized for statistical analysis. Information will be translated from qualitative data to quantitative data. The quantitative data will produce the index values of time spent, criticality, difficulty, and perishability. Many other statistical analyses can be applied to the data for the purpose of rank ordering, multiple regression analyses, cross tabulation of tasks with elements and

sub-elements of the background information, etc. The resulting printouts will be furnished to the state developing the catalog of performance objectives and criterion-referenced measures as a basis for their developmental activities and decision making.

Activity Number VII--Development of Catalogs of Performance Objectives and Criterion-Referenced Measures

The activities prior to Activity VII have emphasized primarily the training and preparation of personnel, the collection and analysis of information, and other preliminary steps necessary to write and catalog performance objectives and criterion-referenced measures. This activity is the application state of the model. Information from incumbent workers is combined with the knowledge of selected instructors, curriculum specialists, criterion-referenced test designers, and educational researchers to transpose the resulting data into meaningful test items. Activity VII contains four sub-activities designed to accomplish this task which are as follows:

Sub-Activity VII-1--Selection and Preparation of the Writing Teams

(1) Selection of Writing Teams--The project director and technical coordinator screen possible writing team candidates and select those instructional personnel which they determine have the potential and interest to write performance objectives and criterion-referenced measures. The writing team will consist of a minimum of one instructor, one technical writer, one person having demonstrated ability and experience in developing criterion-referenced measures and one person

having either local or state supervisory responsibility over the domain being developed. Each writing team should have a preferred alternate member who has responsibility in curriculum development at the local or state level. Exceptions to the writing team composition will be made upon request by the state developing the catalog. The request will be transmitted to the Board of Directors with appropriate justification for the exceptions. Decisions will rest with the Board of Directors.

(2) Preparation of Writing Teams--The state technical coordinator will have the primary responsibility of assisting the project director in the training of the writing team members. The total design of the model will be explained--the results of the state-of-the-art study, the task analysis system, and the conversion process from task statements to performance objectives. Companion criterion-referenced measures will be prepared for each performance objective incorporating performance standards which are used on the job when these standards are available. Components of the training program developed for the Consortium and state technical coordinators will be used as the basis for training and preparing the writing teams for their tasks.

Sub-Activity VII-2--Writing Performance Objectives

All performance objectives developed by the writing teams will meet the definitions and quality criteria set forth in the Memorandum of Agreement. The components of the performance objective will contain the following requirements: situation confronting the learner, action required of the learner, object on which learner is to operate, limits

of performance, measurability of the action, communicability of the objective, and degree of proficiency required of the learner.

Sub-Activity VII-3--Preparing Criterion-Referenced Measures

Each performance objective will have one or more companion criterion-referenced test items to be used by instructional personnel. The test items will be studied to insure that a definite relationship exists between the criterion-referenced item and the standard of performance stated in the performance objective. The definition and components of an acceptable criterion-referenced measure are spelled out in the Memorandum of Agreement and will include: congruence with the performance objective, comprehensibility (expressed at a proper reading level for the level of the training program), objectivity of the test item, integrity expressed in terms of sufficient evidence that the learner can perform the corresponding objective, and equivalence within the test items. The criterion-referenced test item will be developed by the writing teams which develop the performance objectives under the technical direction of the person on the team with test item experience, the director of the project, the technical coordinator in the state, and the technical specialist on the Consortium staff. Particular emphasis would be placed upon explicit information concerning criterion of performance on-the-job and conditions under which performance occurs. Standards would be based upon those used by business and industrial workers.

Sub-Activity VII-4--Developing the Catalog of Performance Objectives and Criterion-Referenced Measures

The performance objectives and criterion-referenced measures will be coded by job classification within the domain being developed. This coding system will be developed by the Consortium and applied to all products of the Consortium. Catalog format and content are outlined in detail and are available through the technical coordinator in each state. All catalogs will be furnished in final draft form (camera ready) for mass production.

Activity Number VIII--Field Testing and Commonality Study

This activity is designed to determine the instructional acceptability of the performance objectives and criterion-referenced measures. The degree of validity will be determined by analysis of teacher and instructor responses to questions during the field test portion of each project. Field test sites and conditions will be selected by the application of a criterion developed by the Board of Directors, Consortium staff, and technical coordinators. Activity VIII consists of four sub-activities as follows.

Sub-Activity VIII-1--Field Testing Design

The field test is designed to control the variables under which the catalogs will be tried by teachers and instructors. Controls are placed upon the selection of the site of field testing, supervisory and administrative support and interest, instructor or teacher interest and ability, type of facilities and equipment, and level of students (junior

high schools, secondary, post-secondary, etc.). The primary emphasis is placed upon determining comprehensibility, utility, and appropriateness for instruction as perceived by the teachers and instructors. Constraints which prevent the use of a given performance objective and companion criterion-referenced measures are identified by the instructional personnel.

Sub-Activity VIII-2--Commonality Review

During the field test, several reviews of performance objectives are made by teachers and instructors for the purpose of identifying the common performance objectives across a wide group of occupational education programs. This commonality study identifies those common performance objectives within the catalog which are applicable in several occupational domains. The common core identified is analyzed for implications for curriculum design in general shop, pre-vocational, and comprehensive career education programs.

Sub-Activity VIII-3--Evaluation of Criterion-Referenced Test Items

A jury including an incumbent worker, a criterion-referenced test item writer, an instructor in the catalog domain area, and a supervisor of the incumbent workers represented would be used to make a final review of the criterion-referenced test items. The primary purpose of this activity will be to reach congruence on the behavior being tested and to permit inference of competence should the learner meet the specified performance.

Sub-Activity VIII-4--Determination of Performance Objectives and Criterion-Referenced Measures Which are Applicable to Hanidcapped Persons

The field test version of the catalog of performance objectives and criterion-referenced test items will be reviewed by a committee of persons to determine their applicability to the training of handicapped persons. The appropriate performance objectives and criterion-referenced test item will be coded for each of the specific types of handicapped persons, i.e., partially sighted, speech defects, hard of hearing, crippled, and mentally retarded, etc. A special review committee for the handicapped will consist of a curriculum developer, an instructor from the catalog domain area and a representative of each of the handicapped groups who has the ability to determine the training limitations of handicapped persons in each group. The work of the committee will be coded and computerized for retrieval for use in planning realistic training programs for the handicapped.

Activity Number IX--Computerize Performance Objectives and Criterion-Referenced Measures

The primary purpose of this activity is to provide immediate response to the states' requests for catalogs. The computer banking of performance objectives and criterion-referenced measures eliminates the time-consuming and costly step of technical editing each time a catalog is revised and updated. Since only those objectives actually changed will be accessed from the computer, the majority remain unchanged and may be retrieved and printed in the same manner each time. Research capabilities, as well as many management possibilities, exist when the

computer is used to do time-consuming calculations, compiling, and cataloging of performance objectives and criterion-referenced measures. This activity contains four sub-activities as follows:

Sub-Activity IX-1--Developing Computer Bank of Performance Objectives Objectives and Criterion-Referenced Measures

After field testing, the catalogs of performance objectives and criterion-referenced measures are processed and placed in a computer bank for rapid retrieval. The coding system adopted by the Consortium is the key to the retrieval system for the computerized information. The information is arranged so that it may be retrieved by domain area or any coded job within a domain. A member of the Consortium may request the total catalog or any of its sub-parts for use in curriculum design and curriculum building. Information is recorded concerning the perceptions of the teachers and instructors during the field test and commonality review. These perceptions concern the comprehensiveness, utility, and appropriateness of the performance objectives and criterion-referenced measures for instruction. In addition, the perceptions concerning the commonality of performance objectives, across several programs in occupational education, are collected for analysis.

Sub-Activity IX-2--Research Aspects of the Computerized Performance Objectives and Criterion-Referenced Measures

(1) Field Test Data--Information collected during the field test activity is analyzed by the computer. The purpose of this analysis is to identify those performance objectives and criterion-referenced measures which appear to be defective. When the defective objectives

and measures have been identified, they are forwarded to the state which developed the catalog with instructions for removing the possible defects.

(2) Commonality Review--The results of the commonality review by teachers and instructors form the basis for the identification of core performance objectives. This common core provides a basis for planning curriculum for pre-vocational, general shop, related subjects, and career education programs. These common performance objectives also provide a framework for prerequisite skills, knowledge, and abilities needed by students to further their preparation for employment at a higher level.

(3) Cross-Analysis Research--Computer programs will be utilized which cross-tabulate and cross-analyze data received from teachers and instructors with data collected from the task analysis based upon surveys of incumbent workers and their immediate supervisors. The research implications of these data are unlimited when incorporated into the Revision and Updating Activities of the model.

Sub-Activity IX-3--Management of Performance Objectives and Criterion-Referenced Measures

The application of a code number to each performance objective, which relates it to a specific domain and, within the domain, to a specific job classification, provides an added degree of manageability. The performance objectives will be retrieved from the computer bank by job classification, by total domain, by commonality elements, or other mixes required for planning various training programs. The computer can be used to compile the catalog by printing out performance objectives

in any desired structure or sub-structure within a domain. Training programs for a new or expanding industry may be designed and retrieved from the computer and can provide those performance objectives which correlate with the job structure of the new industry. The resulting performance objectives provide a realistic planning base for curriculum which must be tailor-made for the task at hand. Many other curriculum management advantages can be developed upon this computer bank of performance objectives. The curriculum design implications are limited only by financial resources and human ingenuity.

Sub-Activity IX-4--Development of Special Reports for Training the Handicapped Learner

The information collected from the work of the special committee for the handicapped (Sub-Activity VIII-4) would be computerized and used as a research base for developing, planning and organizing training programs and activities for the handicapped learner. The performances specified in the objectives and criterion-referenced measures could be modified to permit handicapped workers to demonstrate their ability in terms of particular job titles. Other valuable research could be accomplished by using the data concerning the abilities of the handicapped and comparing it with background information from the incumbent workers and their immediate supervisors.

Activity Number X--In-Service Education and Dissemination Plans

Each state using the materials of the Consortium will develop a comprehensive model for disseminating the catalogs of performance objectives and criterion-referenced measures. In addition, a comprehensive in-service training program must be developed which is designed to prepare both instructional personnel and supervisory personnel in the techniques of managing performance-based instruction. Performance-based instruction requires a thorough knowledge and new skills for teachers and their managers if it is to achieve the desired results. This activity contains sub-activities which are directed toward the achievement of an acceptable degree of implementation of performance-based instruction in the classrooms, laboratories, and shops of participating states.

Sub-Activity X-1--In-Service for Curriculum Developers

Specific programs will be planned for preparing curriculum developers concerning the use of catalogs for organizing learning activities. These programs are to be planned jointly with Consortium staff and include a comprehensive explanation of the system used to develop catalogs, the skills required for retrieving appropriate performance objectives and criterion-referenced measures, and the management strategies necessary to implement a performance-based curriculum effort in the classroom and laboratory. Strategies will also be included to provide direction in the organization and preparation of learning activities.

Sub-Activity X-2--In-Service Education for Teachers and Supervisors

A requirement of Consortium membership is the development, by each state, of an in-service education program for teachers and managers of teachers who will begin to use the catalogs of performance objectives and criterion-referenced measures. The in-service program should be designed to instruct personnel on the intention of the catalog, how to select performance objectives and criterion-referenced measures, and how to supplement their selection with curriculum materials and student learning activities. Those who supervise, direct, or administer programs and have direct contact with the teacher who will be using the material should be trained in the management aspects of performance-based instruction. The basic requirements of the in-service education plan are developed and/or modified by the Board of Directors of V-TECS.

Sub-Activity X-3--Dissemination of Materials

A dissemination outline to be developed by the Board of Directors of V-TECS should serve as a guide for the states. The specific methods of dissemination are left entirely to the participating states. The Consortium staff will assist the states as needed and will encourage the dissemination plan to be integrated with the in-service education plan when at all possible. This integration should insure proper preparation of the users and managers of the learning process and, at the same time, provide a logical point of dissemination.

Activity Number XI--Revision and Updating of the Catalogs

The rapid rate of change in a technical society mandates a better way of keeping vocational-technical instructional materials up-t-date;

but, more importantly, it mandates keeping them relevant to the needs of a modern job structure. This activity is designed to maximize input from instructional personnel, craft advisory committees, and the incumbent worker so that catalogs may be revised on a scientific and as-needed basis. This activity contains four sub-activities which form a cycle for revising and updating the catalogs. The cycle will take approximately three years to complete with a decision to revise and update or not to revise and update at the eighteen-month point in the cycle.

Sub-Activity XI-1--Field Utilization Study

Continuous field study is made regarding the catalogs of performance objectives and criterion-referenced measures. The purposes of the field study are to: (1) detect the defective performance objectives and criterion-referenced measures, (2) identify additional performance objectives which may need to be added to the catalog when it is revised, and (3) obtain a wider participation in the developmental activities, particularly in the area of curriculum materials.

The field utilization study has two major components for achieving the purposes:

(1) Teacher and Curriculum Developer Inputs--During the first year of use, the teachers and curriculum developers will be asked to react to questions concerning readability, comprehensibility, specificity, and appropriateness of performance objectives and criterion-referenced measures. This information is added to the body of data already existing on the performance objective as a result of the commonality study and the field test results.

(2) Craft Advisory Committee Inputs--Early in the second year, the craft advisory committees for the programs using the material review each performance objective and respond to questions concerning (a) the utility of the performance objective, (b) the appropriateness for present job requirements, (c) the extent to which the performance objective is accomplished by entry level employees, relatively experienced employees, and experienced employees, and (d) the relative criticality of the performance objective.

Sub-Activity XI-2--Analysis of Data from Field Utilization Study

The information collected from the field utilization study is computerized, and reports are developed to determine the results. Statistical analysis is applied to the data to accomplish the purposes of the field utilization study. Data are compared with the results of Sub-Activity XI-3, survey of incumbent workers, for the purpose of deciding whether the catalog should be revised and updated or if it is still sufficiently valid for continued use.

Sub-Activity XI-3--Conducting New Task Analysis

The same procedure used in Activity VI, task analysis system, is used at the twenty-fourth month point in the revision and updating cycle. The same task statements are used with the exception that those added by incumbent workers on the initial survey are included for this survey application.

Additional information requested of the incumbent worker is that he add any tasks he is now doing which do not appear on the list and place an asterisk by those task statements which he has begun to

perform for the first time during the last twelve months.

Sub-Activity XI-4--Decision Criteria for Revising and Updating Catalogs

The information collected on the new task analysis is computerized and analyzed. The purpose of the analysis is to determine the extent of new tasks identified by incumbent workers which have been accomplished the first time during the immediate past twelve months. A review of the results of the field utilization study (Sub-Activity XI-1) and the survey of incumbent workers forms the basis for the decision regarding the need for revision and updating of the catalogs or portions of the catalogs. If the data suggests a need for revision, the catalogs are put through the same process as for their initial development.

Activity Number XII--Third Party Evaluation of the Vocational-Technical Education Consortium of States

Evaluation of the Consortium on a biennial basis is considered desirable by the Board of Directors of V-TECS. A third party evaluator will be selected on a low bid basis from a group of competent and qualified evaluators. This type of assessment has important advantages and will serve as a basis for self-renewal. This activity contains three sub-activities which are as follows.

Sub-Activity XII-I--Selection of the Evaluation Team

The Board of Directors of V-TECS will select a qualified low bidder as a third party evaluator from states or organizations outside the membership to evaluate and make recommendations concerning the total

organization and its procedures. This evaluation shall occur within the first two years of the operation and every two years thereafter. The Board of Directors selects and employs the evaluators and sets guidelines for their study. These guidelines will be used as a basis for developing a well-defined and congruent request for proposals.

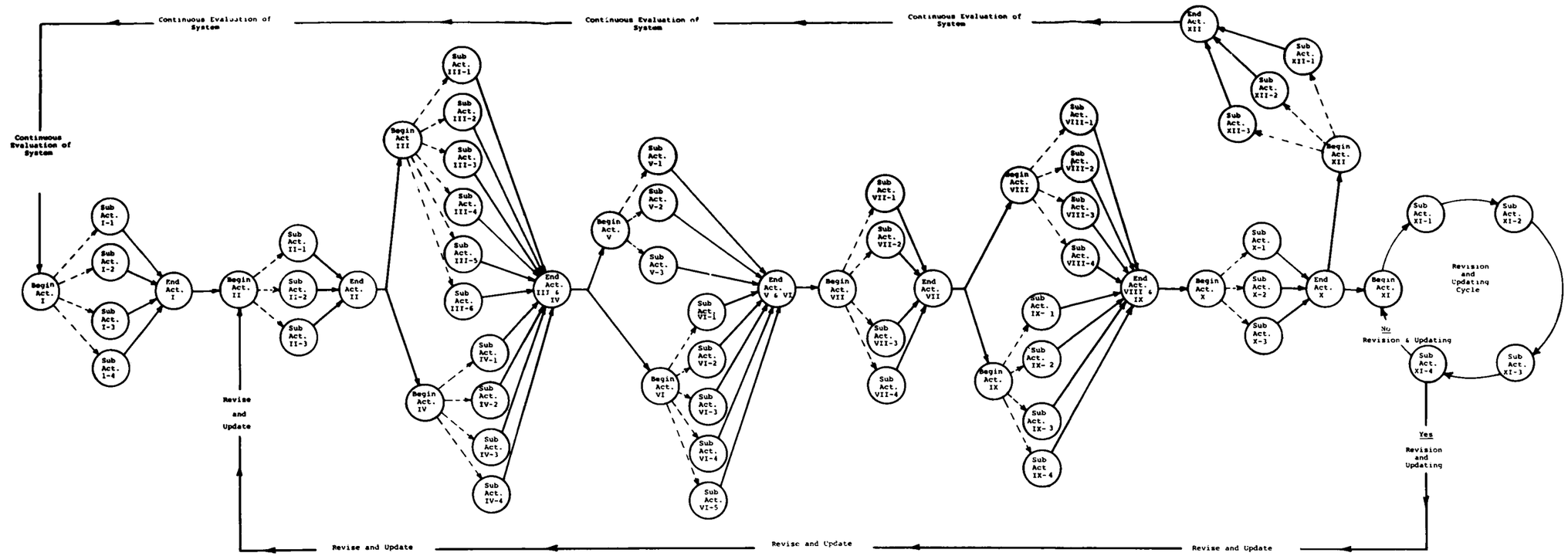
Sub-Activity XII-2--The Evaluation and Report of Results

The evaluation is conducted by a team selected by the Board of Directors. The chairman of the evaluation team will be selected by the successful bidder and the members of the evaluation team. The results of the evaluation are forwarded to the Chairman of the Board of Directors of V-TECS with a copy transmitted concurrently to the Director of the Southern Association of Colleges and Schools, the Executive Secretary of the Commission on Occupational Education Institutions, and the Executive Director of V-TECS.

Sub-Activity XII-3--Implementation of the Recommendations of the Evaluation

The Board of Directors of V-TECS reviews the evaluation results and directs the implementation of the recommended changes as it deems necessary and expedient. The administering agency files its response to the Board of Directors for consideration prior to implementation of recommendations made by the evaluation team.

Figure 12 illustrates the chronological relationship and internal relationship of the activities and sub-activities of the Phase II Activity Model. The sequence of the activities and sub-activities resulted from the responses made by the jury of experts during Delphi Probe I and Delphi Probe II.



I. DETERMINATION OF PRIORITIES AND ASSIGNMENT OF CATALOGS
- I-1. STATE PRIORITY DETERMINATION
- I-2. CONSORTIUM PRIORITY DETERMINATION
- I-3. RESOLUTION OF CONFLICT AND EXCHANGE OF PREVIOUS WORK RELATED TO CATALOGS TO BE DEVELOPED
- I-4. ASSIGNMENT AND/OR SELECTION OF CATALOGS

II. THE MEMORANDUM OF AGREEMENT
- II-1. MINIMUM CONTENTS OF THE MEMORANDUM OF AGREEMENT
- II-2. PROCESSING THE MEMORANDUM OF AGREEMENT
- II-3. SELECTION OF A PROJECT DIRECTOR

III. TECHNICAL PREPARATION OF V-TECS STAFF AND STATE COORDINATORS
- III-1. SYSTEM ORIENTATION
- III-2. DETERMINING DECISION CRITERIA
- III-3. INTERPRETATION OF TASK ANALYSIS DATA
- III-4. DEVELOPING SKILLS IN WRITING PERFORMANCE OBJECTIVES
- III-5. PREPARING CRITERION-REFERENCED TEST ITEMS
- III-6. MONITORING AND QUALITY CONTROL OF PERSONNEL, EDUCATION, AND TRAINING

IV. DOMAIN STUDY FOR CATALOG DEVELOPMENT
- IV-1. STATE-OF-THE-ART STUDY
- IV-2. TASK LIST DEVELOPMENT
- IV-3. DEVELOPMENT OF BACKGROUND INFORMATION
- IV-4. REPORTS OF THE DOMAIN STUDY

V. DEVELOPMENT AND IMPLEMENTATION OF THE DOMAIN SAMPLING TECHNIQUE FOR THE TASK STATEMENT SURVEY
- V-1. DESIGN OF THE SAMPLE
- V-2. ADMINISTRATION OF THE OCCUPATIONAL ANALYSIS SURVEY
- V-3. PROCESSING THE SURVEY RESULTS

VI. OCCUPATIONAL ANALYSIS SYSTEM
- VI-1. TASK TIME-SPENT INDEX
- VI-2. TASK CRITICALITY INDEX
- VI-3. TASK DIFFICULTY INDEX
- VI-4. TASK PERISHABILITY INDEX
- VI-5. PROCESSING OF DATA AND DEVELOPMENT OF REPORTS

VII. DEVELOPMENT OF CATALOGS OF PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES
- VII-1. SELECTION AND PREPARATION OF THE WRITING TEAMS
- VII-2. WRITING PERFORMANCE OBJECTIVES
- VII-3. PREPARING CRITERION-REFERENCED MEASURES
- VII-4. DEVELOPING THE CATALOG OF PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES

VIII. FIELD TESTING AND COMMONALITY STUDY
- VIII-1. FIELD TESTING DESIGN
- VIII-2. COMMONALITY REVIEW
- VIII-3. EVALUATION OF CRITERION-REFERENCED TEST ITEMS
- VIII-4. DETERMINATION OF PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES WHICH ARE APPLICABLE TO HANDICAPPED PERSONS

IX. COMPUTERIZE PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES
- IX-1. DEVELOPING COMPUTER BANK OF PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES
- IX-2. RESEARCH ASPECTS OF THE COMPUTERIZED PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES
- IX-3. MANAGEMENT OF PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES
- IX-4. DEVELOPMENT OF SPECIAL REPORTS FOR TRAINING THE HANDICAPPED LEARNER

X. IN-SERVICE EDUCATION AND DISSEMINATION PLANS
- X-1. IN-SERVICE FOR CURRICULUM DEVELOPERS
- X-2. IN-SERVICE EDUCATION FOR TEACHERS AND SUPERVISORS
- X-3. DISSEMINATION OF MATERIALS

XI. REVISION AND UPDATING OF THE CATALOGS
- XI-1. FIELD UTILIZATION STUDY
- XI-2. ANALYSIS OF DATA FROM FIELD UTILIZATION STUDY
- XI-3. CONDUCTING NEW TASK ANALYSIS
- XI-4. DECISION CRITERIA FOR REVISING AND UPDATING CATALOGS

XII. THIRD PARTY EVALUATION OF THE VOCATIONAL-TECHNICAL EDUCATION CONSORTIUM OF STATES
- XII-1. SELECTION OF THE EVALUATION TEAM
- XII-2. THE EVALUATION AND REPORT OF RESULTS
- XII-3. IMPLEMENTATION OF THE RECOMMENDATIONS OF THE EVALUATION

FIGURE 12. Master sequence chart for the Phase II activity model.

III. CONCLUSIONS

Based upon the data and information in the study the following conclusions are drawn:

1. The Phase I A Priori Activity Model provided a sound basis for the development of Delphi Probe I and contributed to the high reliability estimate (.768) for the instrument during its first use with the jury of experts.

2. The jury of experts recommended six new sub-activities and resequenced four activities and one sub-activity during the responses to Delphi Probe I.

3. When mean responses were analyzed by activity and sub-activity in terms of relative importance under the "IS" (realistic) conditions, observed differences were minqr. Due to the small standard deviations on Delphi Probe III (0 to .751), relative importance between the twelve activities of the model could not be determined.

4. In response to all Delphi probes, the jury of experts consistently rated the "SHOULD BE" (idealistic) estimation of relative importance higher than the "IS" (realistic) estimation of relative importance. The response pattern suggests that under the "idealistic" condition, without consideration of constraints, the activities are of higher importance.

5. The Delphi Technique is an appropriate method for developing a structural/functional activity model resulting from a study under conditions where expert judgment is needed.

6. The Phase II Activity Model is considered adequate for immediate consideration of the Board of Directors of the Vocational-Technical Education Consortium of States.

IV. RECOMMENDATIONS

On the basis of the findings of the study and the trends in the literature, the following recommendations are made:

1. The Vocational-Technical Education Consortium of States should adopt and implement the activity model developed as a result of the study.

2. V-TECS should develop a PERT program or other project control procedure to identify the average time required to develop the products of the consortium by each activity. In addition, costs of implementing each activity should be carefully recorded and made a working part of the project control procedure. Time and cost information would enhance the management of V-TECS and the economic effectiveness of the consortium.

3. V-TECS should instigate further research of the sub-activities in the activity model which have the widest variance between the realistic and idealistic ratings (IS and SHOULD BE). This variance could be an indication of the sub-activities which may be the most difficult to implement from the point of view of the jury of experts.

4. It is recommended that existing agencies and institutions adopt and refine the methodology used in this study for the development of models for other critical endeavors.

5. New consortium efforts should consider using the methodology in this investigation to clarify goals, specify activities and

sub-activities, and improve the cost-effectiveness of the consortium effort.

6. Existing consortia which are anticipating a redirection of goals should consider adopting components of the model which fit their needs and purposes.

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E. Interviews

Driskill, Dr. Walter E, Chief, Occupational Career Development Branch, Occupational Measurement Squadron, Lackland Air Force Base, Texas, March 15, 1973. Personal Interview.

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APPENDICES

APPENDIX A

June 26, 1973

Dr. George W. Weigers, Jr.
Professor and Chairman
Doctoral Committee of Ben A. Hirst, Jr.
Department of Vocational-Technical Education
College of Education, Henson Hall
The University of Tennessee
Knoxville, Tennessee 37916

Dear Dr. Wiegers:

The purpose of this letter is to offer my support and endorsement to the dissertation being developed by Ben A. Hirst, Jr.

For the past several months the Commission on Occupational Education Institutions of the Southern Association of Colleges and Schools has been developing a multi-state consortium to produce new definitions of performance objectives and criterion-referenced measures in Occupational Education. This consortium, when formed, will have two unique features. It will be the first such consortium composed of a large group of state divisions of vocational-technical education in the country. Secondly, this will be the first effort of a group of states to develop jointly and cooperatively instructional objectives in performance terms. This approach will help broaden the comprehensive listing and use of performance objectives and criterion reference measures and ultimately can reduce barriers to more effective interstate cooperation in vocational-technical education.

Mr. Ben Hirst, through his dissertation, will be able to organize a body of knowledge and information which, at this time, is not available except in a highly fragmented state. After synthesis of this information, he will develop a model for use by the consortium to manage the development, validation, production, dissemination, and in-service training necessary for implementation of the consortium's products.

I trust that this endorsement will be helpful to Ben and expect that his work will make a significant contribution to occupational education.

Sincerely,

Felix C. Robb
Director

SOUTHERN ASSOCIATION OF COLLEGES AND SCHOOLS

795 Peachtree Street, N.E. • Atlanta, Georgia 30308

Phone 875-8011 Area Code 404

June 27, 1973

Dr. George W. Wiegers, Jr.
308 Morgan Hall
The University of Tennessee
Knoxville, Tennessee 37916

Dear Dr. Wiegers:

As you know we are now involved with the Florida State Department of Education in the development of a multi-state consortium for the production of catalogs of performance objectives and criterion-referenced measures in Occupational Education. During the first stages of the development of the consortium we have conducted exploratory research into the status of this movement. The results of our findings are not totally clear but we have identified a need for the development of a model to manage the product of the consortium. To date, we have located five models which have been used to produce performance objectives. Only two of these deal directly with criterion-referenced measures to support the objectives.

In view of these findings we wish to endorse the dissertation study of Ben Hirst for development of a model which will facilitate the consortium objectives and which will form an operational base for the activities of the consortium.

This consortium will be the first such effort between the state divisions of vocational education in this country on such a broad scale. Because of this, I am of the opinion that a comprehensive model to manage the development, production, validation, dissemination, and teacher education necessary to operationalize the catalogs is much in need.

If you should have suggestions or should you need additional information concerning our rationale, please feel free to contact me.

Sincerely,

B. E. Childers, Executive Secretary
Commission on Occupational Education
Institutions

BEC/gd

APPENDIX B

SCHEDULE OF ON-SITE INTERVIEWS

Place and Date of Meetings	Persons in Meeting
Florida Department of Education Division of Vocational-Technical Education Tallahassee, Florida December 21, 1972 March 20, 1973	Dr. Kenneth Eaddy Dr. Roy Giehls
Michigan Department of Education Division of Vocational-Technical Education Lansing, Michigan March 12, 1973	Dr. Jack Miche Mr. Phillip Bailey
Alabama Department of Education Division of Vocational-Technical Education Montgomery, Alabama February 20, 1973	Mr. T. L. Faulkner Miss Ruth Stovall Mr. Hubert Worthy Mr. Bill Reitz
Air Training Command U. S. Air Force Randolph Air Force Base San Antonio, Texas March 15, 1973 May 14, 1973	Dr. Walter Driskill Dr. Raymond Christal Dr. Wayne Archer Col. John Phipps Lt. Col. Richard Culbertson
Project CAREER Massachusetts Department of Education Division of Vocational-Technical Education Randolph, Massachusetts April 10, 1973	Dr. Clifford Easton (Atlanta, Georgia, April 3, 1973 Mr. Vincent Lamo (Successor to Dr. Easton)
Aerospace Education Foundation (Utah Project) 500 Pennsylvania Avenue Washington, D. C. May 3, 1973	Mr. James Straubel Mr. Mike Nisos

United States Office of Education Division of Occupational and Adult Education National Center for Curriculum Development Washington, D. C. May 4, 1973	Dr. Elizabeth Simpson Dr. Sidney High Mr. Michael Russo
Educational Testing Service Occupational Education Division Princeton, New Jersey June 5, 1973	Dr. Raymond Wasdyke Dr. Benjamin Shimberg Dr. Reid Creech
Western Interstate Commission for Higher Education (WICHE) Boulder, Colorado June 11-12, 1973	Dr. Robert Kroepsch Dr. Ben Lawrence Dr. Robert Stubblefield
University of Denver Bureau of Educational Research and Service Denver, Colorado June 11, 1973	Dr. Jack Keegan Dr. Ronald Feltes Dr. Ralph Forsyth Dr. Eugene Harrison

APPENDIX C

PREVIEW COMMITTEE FOR DELPHI PROBE I

Special Committee Members

Dr. Bob E. Childers, Executive Secretary
Commission on Occupational Education Institutions
Southern Association of Colleges and Schools
795 Peachtree Street
Atlanta, Georgia 30308

Dr. Phares S. Nye, Associate Executive Secretary
Commission on Occupational Education Institutions
Southern Association of Colleges and Schools
795 Peachtree Street
Atlanta, Georgia 30308

Dr. Tracy Ramsey, Assistant to the Director
Southern Association of Colleges and Schools
795 Peachtree Street
Atlanta, Georgia 30308

Mr. LeRoy Netrick, Technical Representative
Field Enterprises, Inc.
Denver, Colorado

Dr. George W. Wiegers, Jr.
Head of Agriculture Education
Department of Vocational-Technical Education
The University of Tennessee
Knoxville, Tennessee 37916

Dr. Charles M. Achilles
Head of Bureau of Educational Research and Services
College of Education
The University of Tennessee
Knoxville, Tennessee 37916

Dr. Garry Bice, Director
Research Coordinating Unit for Occupational Education
The University of Tennessee
Knoxville, Tennessee 37916

Professor Joe F. Reed
Head of Trade and Industrial Education
Department of Vocational-Technical Education
The University of Tennessee
Knoxville, Tennessee 37916

Dr. Edgar Ray Smith
Associate Professor of Business Education
Department of Vocational-Technical Education
The University of Tennessee
Knoxville, Tennessee 37916

APPENDIX D



SOUTHERN ASSOCIATION OF COLLEGES AND SCHOOLS

795 Peachtree Street, N.E. • Atlanta, Georgia 30308

Phone 875-8011 Area Code 404

August 7, 1973

Dr. Roy Giehls, Consultant
Vocational Research & Evaluation Function
State of Florida
Department of Education
Tallahassee, Florida 32304

Dear Dr. Giehls:

The purpose of this letter is to request permission to use in our study, the Florida Model for developing performance objectives and criterion-referenced measures in occupational education. The primary source of reference would be the material embodied in the First Report of our project. Of course, all material will be properly credited in reference to the source. The Florida Model would be used along with six other models from various states and agencies to synthesize and develop a model for consideration by the Vocational-Technical Education Consortium of States.

I would appreciate your consideration of this request and will await your reply. I enjoyed meeting with you August 2 and 3 and look forward to a continued and fruitful working association.

Sincerely,

Ben A. Hirst, Jr.
Executive Director
Vocational-Technical Education
Consortium of States

BAH/gd

SOUTHERN ASSOCIATION OF COLLEGES AND SCHOOLS

795 Peachtree Street, N.E. • Atlanta, Georgia 30308

Phone 875-8011 Area Code 404

August 7, 1973

Lt. Col. R. N. Culbertson
Chief, Liason Division - Stop 28
Community College of the Air Force
Randolph Air Force Base, Texas 78148

Dear Col. Culbertson:

The purpose of this letter is to request permission to use the Air Force Instructional Systems Design Model in our study of models used to develop and implement criterion-referenced instruction. If possible, we would propose to use the Air Force I.S.D. model along with six other models to synthesize an operational model for the Vocational-Technical Education Consortium of States. The I.S.D. model used by the Air Force is very comprehensive and could probably form the framework for the model to be used by the Consortium. As you know, there are a few components which need modification and a few components which must be added in order for the I.S.D. model to meet the requirements of the Consortium.

We believe the combination of the best elements of the seven models to be studied will result in a comprehensive model to be considered for use by the Consortium. Of course, all materials used will be footnoted and full credit given the sources.

Thank you very much for your splendid cooperation and support to date. I think that the contributions of the Air Force in the form of technical assistance and advice have been extremely valuable during the formative

stages of this effort. A great deal of credit is due Colonel Phipps, yourself, Captain Bob Childs, and Sgt. Koscheski.

Sincerely,

Ben A. Hirst, Jr.
Executive Director
Vocational-Technical Education
Consortium of States

BAH/gd



SOUTHERN ASSOCIATION OF COLLEGES AND SCHOOLS

795 Peachtree Street, N.E. • Atlanta, Georgia 30308

Phone 875-8011 Area Code 404

August 7, 1973

Mr. Hubert Worthy
Branch Director
State Technical Institutes
State Department of Education
Montgomery, Alabama 36104

Dear Mr. Worthy:

The purpose of this letter is to request a description of the procedures used by the State of Alabama in the production of measurable objectives in vocational-technical education. A graphic or narrative model will suffice. We wish, at the same time, to request permission to use components of your procedure in a model to be developed and considered for use by the Vocational-Technical Education Consortium of States. Any materials supplied and used in the development of the model will be properly credited to the source.

We are studying six other models used by other states and agencies and it occurred to me that we might well benefit from your experience and efforts to date. When the study is completed, we will provide you with a copy if you desire.

Thank you for your help. I look forward to a continued close working relationship with you and the State of Alabama as the Consortium develops.

Sincerely,

Ben A. Hirst, Jr.
Executive Director
Vocational-Technical Education
Consortium of States

BAH/gd

cc: Miss Ruth Stovall
Branch Director - Program Services

SOUTHERN ASSOCIATION OF COLLEGES AND SCHOOLS
795 Peachtree Street, N.E. • Atlanta, Georgia 30308
Phone 875-8011 Area Code 404

August 7, 1973

Mr. Phillip Bailey
Supervisor of Secondary Unit
Vocational Education and Career
Development Service
Box 928
Michigan Department of Education
Lansing, Michigan 48904

Dear Mr. Bailey:

The purpose of this letter is to request the use of the Michigan material for developing performance objectives in vocational-technical education. We are in the process of reviewing six other models used by various states and agencies to develop these instructional items. We propose to synthesize a model based upon this study for use by the Vocational-Technical Education Consortium of States.

When we complete the resulting model, we will provide you with a copy upon request. All elements and/or components that might be used from the Michigan model will be properly credited and footnoted. If you have added and/or deleted components from your model, would you please advise me of the changes and the nature of the changes.

I trust all is going well with you and your efforts in Michigan. I hope to hear from you soon.

Sincerely,

Ben A. Hirst, Jr.
Executive Director
Vocational-Technical Education
Consortium of States

BAH/gd

SOUTHERN ASSOCIATION OF COLLEGES AND SCHOOLS

795 Peachtree Street, N.E. • Atlanta, Georgia 30308

Phone 875-8011 Area Code 404

August 7, 1973

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

Dear Mr. Lamo:

The purpose of this letter is to request permission to use the Project CAREER Model as one of seven which will be studied to synthesize and develop a model which will be considered for use by the Vocational-Technical Education Consortium of States. Of Course, full credit will be given the source of any material used in the study.

If you have modified your model by either addition or deletion of components, I would appreciate knowing the specifics involved as well as the nature of the changes.

I trust all is going well with you in your new job. I wish the best of luck to you and look forward to working with you and your staff in the future.

Sincerely,

Ben A. Hirst, Jr.
Executive Director
Vocational-Technical Education
Consortium of States

BAH/gd



SOUTHERN ASSOCIATION OF COLLEGES AND SCHOOLS

795 Peachtree Street, N.E. • Atlanta, Georgia 30308

Phone 875-8011 Area Code 404

August 8, 1973

Dr. Raymond Wasdyke
Associate Examiner
Educational Testing Service
Princeton, New Jersey 08540

Dear Dr. Wasdyke:

The purpose of this letter is to request permission to use the material obtained from you concerning criterion-referenced instruction and the development of performance objectives. We are developing a model for use by the Vocational-Technical Education Consortium of States based upon a thorough study of seven models used by various states and agencies. All materials used will be properly footnoted and full credit will be given the sources.

We will share with you the results of our study after validation by a jury of experts. I trust all is going well with you and your many activities.

I'm looking forward to working with you on this project and future efforts as the Consortium develops.

Sincerely,

Ben A. Hirst, Jr.
Executive Director
Vocational-Technical Education
Consortium of States

BAH/gd

APPENDIX E

SOUTHERN ASSOCIATION OF COLLEGES AND SCHOOLS

795 Peachtree Street, N.E. • Atlanta, Georgia 30308

Phone 875-8011 Area Code 404

September 10, 1973

Dear

The Southern Association of Colleges and Schools' Commission on Occupational Education Institutions has organized a seven state Consortium. The Vocational-Technical Education Consortium of States (V-TECS) was organized to develop catalogs of performance objectives and criterion-referenced measures in Occupational Education.

These catalogs will be developed based upon a thorough survey of incumbent workers by use of a task statement inventory. The information from the incumbent worker's responses to the task statements will form the basis for developing performance objectives and criterion-referenced measures.

We have selected you as a possible member of a jury of experts to respond to the model for managing the activities and products of the Consortium. You were selected because of your experience in performance-based instruction or your leadership position in Vocational-Technical Education.

If you are willing to serve on the jury of experts, please complete and return the enclosed card. I will be providing you with additional information if you agree to serve.

I'm looking forward to working with you on this study.

Sincerely,

Ben A. Hirst, Jr.
Executive Director
Vocational-Technical Education
Consortium of States

BAH/bs
Enclosure



SOUTHERN ASSOCIATION OF COLLEGES AND SCHOOLS

795 Peachtree Street, N.E. • Atlanta, Georgia 30308

Phone 875-8011 Area Code 404

September 28, 1973

Dear

Thank you very much for agreeing to serve on our jury of experts to assist in the development and refinement of a model for managing the products of the Vocational-Technical Education Consortium of States.

We will be using the Delphi Technique to develop the model with input from a jury of experts consisting of yourself and twenty-five to thirty leading educators. The model is somewhat complex and will come to you the first time partially developed. You will have the opportunity to recommend additional components as well as to react to the sequence of the components. Pretest results of the instrument have provided us with an average time for completion of the first Delphi probe of one hour and ten minutes. Our best estimate is that we will need about four to five hours of your time over the next four months to complete the study.

Again, I thank you. I will be sending you the first Delphi probe within three weeks.

Sincerely,

Ben A. Hirst, Jr.,
Executive Director
Vocational-Technical Education
Consortium of States

BAH/bs



SOUTHERN ASSOCIATION OF COLLEGES AND SCHOOLS

795 Peachtree Street, N.E. • Atlanta, Georgia 30308

Phone 875-8011 Area Code 404

November 19, 1973

Dear

A few days ago you should have received a copy of the Phase I Model for the future use of the Vocational-Technical Education Consortium of States. We have not received your response and would appreciate your taking time from your busy schedule to complete and return the first Delphi probe.

You represent one of four subgroups on the jury of experts and for this reason your response is important and vital to the success of the study.

If you have completed the first Delphi probe, please disregard this letter and accept my thanks.

Sincerely,

Ben A. Hirst, Jr., Executive Director
Vocational-Technical Education
Consortium of States

BAH/vm

SOUTHERN ASSOCIATION OF COLLEGES AND SCHOOLS

795 Peachtree Street, N.E. • Atlanta, Georgia 30308

Phone 875-8011 Area Code 404

December 21, 1973

Dear

I want to take this opportunity to thank you for your responses to the first Delphi probe. Your responses were incorporated in the second probe. This probe has five new sub-activities and a few word changes. I'm quite encouraged by the excellent work of the thirty-seven member jury of experts.

Enclosed is the second Delphi probe for developing the Phase I Model for use by the Vocational-Technical Education Consortium of States to manage the development, production, dissemination, and implementation of catalogs of performance objectives and criterion-referenced measures in Occupational Education. The second probe will probably be the most complex of the three probes we plan to use. It will take approximately one hour and twenty minutes to complete. Please return the completed probe by January 7, 1974.

If you should have questions concerning the second probe or the instructions, please call me at (404) 875-8011.

Sincerely,

Ben A. Hirst, Jr.,
Executive Director
Vocational-Technical Education
Consortium of States

BAH/bs

Enclosure

SOUTHERN ASSOCIATION OF COLLEGES AND SCHOOLS

795 Peachtree Street, N.E. • Atlanta, Georgia 30308

Phone 875-8011 Area Code 404

January 11, 1974

JUST A REMINDER!

Dear

A few days ago you should have received the second modified Delphi probe for the development of a model to be considered for use by the Vocational-Technical Education Consortium of States. If you have not completed the probe please take time to do so. Your participation is EXTREMELY VITAL to the successful completion of this research project.

Thank you very much.

Sincerely

Ben A. Hirst, Jr.,
Executive Director
Vocational-Technical Education
Consortium of States

BAH/bs



SOUTHERN ASSOCIATION OF COLLEGES AND SCHOOLS

795 Peachtree Street, N.E. • Atlanta, Georgia 30308

Phone 875-8011 Area Code 404

January 17, 1974

Dear

The response has been GOOD to the second Delphi probe. However, I do need your support and input to make the project a complete success.

I realize you are a very busy person and that your time is valuable but I would like to ask you to take a few minutes after dinner--or at another convenient time--to respond to the second Delphi probe.

Your time and efforts will be greatly appreciated.

Sincerely,

Ben A. Hirst, Jr.,
Executive Director
Vocational-Technical Education
Consortium of States

BAH/bs



SOUTHERN ASSOCIATION OF COLLEGES AND SCHOOLS

795 Peachtree Street, N.E. • Atlanta, Georgia 30308

Phone 875-8011 Area Code 404

February 8, 1974

Dear

Enclosed is Delphi Probe III for the development of a model to be used by the Vocational-Technical Education Consortium of States to manage its products and services. This will be the last probe but it is considered to be the most vital to the successful completion of the project.

Two attachments are included with the model. Attachment "A" is the sequence chart which has been completed by a 98.1% concurrence of the jury of experts during Delphi Probe II. (Attachment "A" is furnished for reference purposes only.) Attachment "B" is the key to the responses required of the jury of experts on Delphi Probe III. This probe will require only one reading in conjunction with Attachment "B". It should take approximately one hour and ten minutes to complete.

We appreciate your effort in this project and will be forwarding information to you concerning reports of the results when Delphi Probe III is returned. Your expert opinions have added depth and quality to the proposed model.

If you have questions, please feel free to call (404) 875-8011 collect or write to me.

Sincerely,

Ben A. Hirst, Jr.,
Executive Director
Vocational-Technical Education
Consortium of States

BAH/vm



SOUTHERN ASSOCIATION OF COLLEGES AND SCHOOLS

795 Peachtree Street, N.E. • Atlanta, Georgia 30308

Phone 875-8011 Area Code 404

February 25, 1974

JUST A REMINDER!

Dear

A few days ago we mailed you a copy of the Delphi Probe III for the model being developed for use by the Vocational-Technical Education Consortium of States.

We have not received your response to date and want to encourage you to complete this third and final step in the study. Your response is considered vital to the study.

If you have responded, please excuse the nuisance of this letter.

Sincerely,

Ben A. Hirst, Jr.,
Executive Director
Vocational-Technical Education
Consortium of States

BAH/bs



SOUTHERN ASSOCIATION OF COLLEGES AND SCHOOLS

795 Peachtree Street, N.E. • Atlanta, Georgia 30308

Phone 875-8011 Area Code 404

February 25, 1974

Dear

I want to take this opportunity to express my sincere thanks and appreciation for the hours of hard work which you contributed to the development of the model to be considered for use by the Board of Directors of the Vocational-Technical Education Consortium of States (V-TECS). Your expertise and considered judgment on the importance and sequencing of the many activities should contribute significantly to the overall success of the Consortium. The use of the jury and the Delphi technique certainly added clarity, depth, and logic to the model.

If you wish to have copies of the finished study, please complete the attached post card. Copies of the study will be ready for distribution about the last of April or the middle of May (subject to printing availability at this time of year). In addition, a list of the jury of experts has been included with this letter so that you may be made aware of those people involved in the project.

Thanks again for a job well done.

Sincerely,

Ben A. Hirst, Jr.,
Executive Director
Vocational-Technical Education
Consortium of States

BAH/vm

Attachments

APPENDIX F

PHASE I MODEL FOR USE BY THE VOCATIONAL-TECHNICAL EDUCATION CONSORIUM OF STATES TO MANAGE THE DEVELOPMENT, PRODUCTION, DISSEMINATION, AND IMPLEMENTATION OF CATALOGS OF PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES IN OCCUPATIONAL EDUCATION

JURY OF EXPERTS

Mr. Ray Barber, Director
Division of Occupational Research and Development
Texas Education Agency
201 East Eleventh Street
Austin, Texas 78701

Dr. Gary F. Beasley, Technical Coordinator
Mississippi State University
Research Coordinating Unit for
Vocational-Technical Education
P. O. Drawer DX
State College, Mississippi 39762

Dr. Gene Bottoms, Director
Division of Program and Staff Development
Division of Vocational Education
State Department of Education
State Office Building
Atlanta, Georgia 30334

Dr. Wendell Bruce, Director
Division of Vocational Program Management
State Department of Education
Frankfort, Kentucky 40601

Lt. Col. R. N. Culbertson, Chief
Liaison Division - Stop 28
Community College of the Air Force
Randolph Air Force Base, Texas 78148

Dr. Walter E. Driskill, Chief
Occupational Career Development Branch
Occupational Measurement Squadron
Lackland Air Force Base, Texas

Mr. Charlie M. Dunn, Dean of Instruction
Nashville State Technical Institute
120 White Bridge Road
Nashville, Tennessee 37209

Dr. Kenneth M. Eaddy, Administrator
Vocational Research and Evaluation
Division of Vocational, Technical, and
Adult Education
State of Florida
Department of Education
Tallahassee, Florida 32304

Dr. Clifford Easton
Private Educational Consultant
75 Blanchard Road
South Weymouth, Massachusetts 03190

Mr. W. H. Fitz, Education Programs Director
Office of the Deputy Associate Commissioner for
Occupational Education and Technology
Texas Education Agency
201 East Eleventh Street
Austin, Texas 78701

Dr. Roy Giehls, Consultant
Vocational Research and Evaluation Function
State of Florida
Department of Education
Tallahassee, Florida 32304

Mr. Harold C. Gregory, Curriculum Specialist
Comprehensive Vocational Education
243 Cordell Hull Building
Nashville, Tennessee 37219

Dr. Wallace H. Hannum, Assistant Professor
Department of Educational Research
and Center for Educational Technology
Florida State University
415 North Monroe Street
Tallahassee, Florida 32301

Mr. Tom L. Hindes, Director
Instructional Materials Laboratory
Trade and Industrial Education
The Ohio State University
1885 Neil Avenue
Columbus, Ohio 43210

Dr. John J. Keegan, Supervisor
Evaluation and Program Unit
Salem Public Schools
Salem, Oregon 97302

Mr. James Kendrick, Curriculum Specialist
Room 855
State Department of Education
State Office Building
Montgomery, Alabama 36104

MSgt. Billy J. Koscheski, Curricular Materials Branch
Community College of the Air Force
Randolph AFB, Texas 78148

Dr. James D. McComas
Dean, College of Education
The University of Tennessee
Knoxville, Tennessee 37916

Lt. Blaine Lee, Curriculum Specialist USAF
1706 B. Rockbridge Terrace
Austin, Texas 78741

Dr. Leon M. Lessinger, Dean
College of Education
University of South Carolina
Columbia, South Carolina 29208

Mr. James Marable, Head
Data Processing Technology Department
Nashville State Technical Institute
120 White Bridge Road
Nashville, Tennessee 37209

Mr. Ronald Meeks, Director
Curriculum Laboratory
Division of Vocational-Technical Education
1515 West Sixth Street
Stillwater, Oklahoma 74074

Mr. Mike Nisos, Managing Director
Aerospace Education Foundation
1750 Pennsylvania Avenue NW
Washington, D. C. 20006

Dr. George L. O'Kelley, Jr., Chairman
Division of Vocational Education
College of Education
University of Georgia
Athens, Georgia 30601

Dr. J. Dale Oliver, Director
Vocational Education Evaluation Project
Division of Vocational and Technical Education
Virginia Polytechnic Institute and State University
Blacksburg, Virginia 24061

Mr. Bill Reitz, Planning Specialist
State Technical Institute
Division of Vocational, Technical, and Higher Education
State Office Building
Montgomery, Alabama 36104

Dr. Charles Rogers, Director
Occupational Research Unit
Department of Public Instruction
State Department of Education
State Office Building
Raleigh, North Carolina 27611

Mr. Paul Scott, Director
Occupational Research Coordinating Unit
State Department of Education
Room 250, State Office Building
Atlanta, Georgia 30334

Dr. James W. Selman, Associate Professor
College of Education
University of South Florida
Tampa, Florida 33620

Dr. Glenn C. Shinn, Associate Professor
University of Missouri-Columbia
College of Agriculture
100 Agriculture Engineering Building
Columbia, Missouri 65201

Mr. Robert Spillman, Coordinator
Career Education Curriculum Development Center
Department of Vocational Education
University of Kentucky
Lexington, Kentucky 40506

Miss Ruth Stovall, Branch Director
Program Services
Division of Vocational, Technical, and
Higher Education
State Office Building
Montgomery, Alabama 36104

Miss Gail Trapnell, Assistant Administrator and
Area 1 Supervisor
Distributive Education
State of Florida
Tallahassee, Florida 32304

Dr. James E. Wall, Director
Curriculum and Coordinating Units
Mississippi State University
State College, Mississippi 39762

Dr. Charles F. Ward, Dean
School of Applied Sciences and Technology
U. P. O. 721
Morehead State University
Morehead, Kentucky 40351

Dr. Raymond Wasdyke, Associate Examiner
Educational Testing Service
Princeton, New Jersey 08540

Mr. William F. Wieser, Instructor
School of Education
1714 S.W. "A" Street
Oregon State University
Corvallis, Oregon 97330

APPENDIX G

February 5, 1974

Mr. Ben A. Hirst, Jr.
Executive Director
Vocational-Technical Education
Consortium of States
795 Peachtree Street, N.E.
Atlanta, Georgia 30308

Dear Mr. Hirst:

Confirming our conversation of today, Educational Testing Service is pleased to grant you permission to adapt and use the scale from the Institutional Goals Inventory for the purpose of a small study you are conducting. We require only that no further copies of your instrument be made without a citation to the ETS instrument, and that any report of your study indicate that the scale used was adapted from the above instrument with the permission of ETS.

Our Institutional Research Program for Higher Education (IRPHE) group here at ETS would be interested in seeing a copy of your instrument, as well as your report, when available. In addition, would you please provide them with a copy of the sample questionnaire you received from Charlie Ward of Morehead State University. IRPHE has worked closely with Morehead State in the past, and would like to keep in touch with what is going on there. Please send the above materials to:

Miss Nancy Beck
IRPHE
Educational Testing Service
Princeton, New Jersey 08540

If these arrangements are satisfactory, please sign both copies of this letter and return one copy to me for our records.

Sincerely,

(Mrs.) Dorothy Urban
Copyrights, Licensing and
Permissions Administrator

DU/lrs
cc: Miss Beck
ACCEPTED AND AGREED TO:

Ben A. Hirst, Jr.

SOUTHERN ASSOCIATION OF COLLEGES AND SCHOOLS

795 Peachtree Street, N.E. • Atlanta, Georgia 30308

Phone 875-8011 Area Code 404

February 11, 1974

Mrs. Dorothy Urban
Copyrights, Licensing and
Permissions Administrator
Educational Testing Service
Princeton, N. J. 08540

Dear Mrs. Urban:

Thank you very much for your letter of February 5 granting me permission to use the scale from a study conducted by ETS for the National Laboratory for Higher Education.

The third and final Delphi probe has already been mailed to the jury of experts (36 members) and, therefore, we will not be able to print the credit for the scale on the instrument used during the study. We will, however, appropriately cite the scale on all instruments which are put in reports subsequent to the study. I have looked high and low for the xerox copy of the instrument provided by Charlie Ward of the Morehead State University from which we developed the scale used in our survey instrument. We will continue to look for the material mentioned in your letter and I will mail items as per your request to Miss Nancy Beck.

Enclosed is a signed letter of agreement for your file. If you have additional questions or concerns please call or write.

Sincerely,

Ben A. Hirst, Jr.,
Executive Director
Vocational-Technical Education
Consortium of States

BAH/bs
cc: Miss Nancy Beck



SOUTHERN ASSOCIATION OF COLLEGES AND SCHOOLS

795 Peachtree Street, N.E. • Atlanta, Georgia 30308

Phone 875-8011 Area Code 404

February 11, 1974

Miss Nancy Beck
IRPHE
Educational Testing Service
Princeton, New Jersey 08540

Dear Miss Beck:

Enclosed is a copy of a letter that I have written to Mrs. Urban concerning the use of copyrighted material included in the Institutional Goals Inventory.

As per Mrs. Urban's request, I am sending to you a copy of each of the three Delphi probes submitted to a jury of experts consisting of thirty-six members.

We will credit ETS for the scales used in our Delphi probes as reports are developed and distributed. So far, we have not been able to locate the initial photo copy of the survey instrument provided by Charlie Ward in which Morehead University utilized the same scale. When we locate the copy of the questionnaire, we will forward it to you. If you should have questions please feel free to call or write.

Sincerely,

Ben A. Hirst, Jr.,
Executive Director
Vocational-Technical Education
Consortium of States

BAH/bs
cc: Mrs. Dorothy Urban

SOUTHERN ASSOCIATION OF COLLEGES AND SCHOOLS
795 Peachtree Street, N.E. • Atlanta, Georgia 30308
Phone 875-8011 Area Code 404

March 1, 1974

Miss Nancy Beck
IRPHE
Educational Testing Service
Princeton, New Jersey 08540

Dear Miss Beck:

Enclosed is a photo copy of a photo copy of the instrument given to me by Dr. Ward at Morehead University. Sorry for the delay in sending this to you but I had some difficulty in locating the copy.

I trust this information will complete the requirements set forth in Mrs. Dorothy Urban's letter of February 5.

Sincerely,

Ben A. Hirst, Jr.
Executive Director
Vocational-Technical Education
Consortium of States

BAH/bs

cc: Mrs. Dorothy Urban

Enclosure

APPENDIX H

SOUTHERN ASSOCIATION OF COLLEGES AND SCHOOLS

Commission on Occupational Education Institutions

Vocational-Technical Education Consortium of States

PHASE I MODEL FOR USE BY THE VOCATIONAL-TECHNICAL EDUCATION CONSORTIUM OF STATES TO MANAGE THE DEVELOPMENT, PRODUCTION, DISSEMINATION, AND IMPLEMENTATION OF CATALOGS OF PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES IN OCCUPATIONAL EDUCATION

A Research Project
Conducted by
Ben A. Hirst, Jr.
September, 1973

SOUTHERN ASSOCIATION OF COLLEGES AND SCHOOLS

COMMISSION ON OCCUPATIONAL EDUCATION INSTITUTIONS

VOCATIONAL-TECHNICAL EDUCATION CONSORTIUM OF STATES

Background Information

NAME:

POSITION: (Check the most predominant area of your work)

____ Administrator ____ Teacher Educator

____ Supervisor ____ Teacher or Instructor

____ Researcher

____ Other _____
(Please Specify)

Please indicate below your relative experience with performance-based instruction and criterion-referenced measures.

____ Very Experienced ____ Slightly Experienced

____ Experienced ____ Inexperienced

After completion of this survey, please remember to return it in the enclosed envelope within 5 days to:

Ben A. Hirst, Jr., Executive Director
Vocational-Technical Education
Consortium of States
Southern Association of Colleges and Schools
795 Peachtree Street, N.E.
Atlanta, Georgia 30308

INSTRUCTIONS

The Phase I Model has been developed through an extensive review of seven models and an exhaustive review of the related literature. The development of the Phase II Model, which will be considered by the Vocational-Technical Education Consortium of States, depends upon your expert opinion and perception regarding the content of the activities and sub-activities and their sequential relationship to each other.

The needed responses to the elements of the Phase I Model have been organized into two distinct steps:

First Step--Read each activity and sub-activity and respond to the scale which appears as follows:

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☑	☐	☐
SHOULD BE	☐	☑	☐	☐	☐

IS -- The row of boxes following IS should be checked at the appropriate place which represents your opinion of the importance of the sub-activity under the constraints presently known to you. (This IS response will be considered your realistic estimation of the importance.)

SHOULD BE -- The row of boxes following SHOULD BE is to be checked at the appropriate place which represents your opinion of the importance of the sub-activity without consideration of constraints known to you. (This SHOULD BE response is considered your idealistic estimation of the importance.)

At the end of each of the twelve (12) major activities in the Phase I Model you are provided space to add additional sub-activities. If you desire you may include additional major activities and suggested sub-activities under these by attaching a piece of paper outlining your recommendations.

Instructions (continued)

Those elements added by the jury of experts will appear on the second Delphi probe.

Second Step--After completing the rating of importance in the First Step, please return to the first page of the Phase I Model and refer to the Phase I Model Master Sequence Chart, Attachment "A." Review each activity in terms of its proper or improper sequence. Your own experience and judgment should be the criteria used to respond to the sequencing of activities. If, in your opinion, the activity is properly sequenced, then check the appropriate box. If, on the other hand, the sequencing is improper, check the appropriate box and recommend the proper sequence of the activity.

GLOSSARY OF TERMS

1. Catalog - A collection of performance objectives and companion criterion-referenced test items organized by domain area and further broken down by job titles within the domain.

2. Criterion-Referenced Test Exercise - A criterion-referenced test exercise is an exercise based upon a performance objective and is designed to allow the determination of whether or not the learner has accomplished the objective. It possesses each of the characteristics specified below:

   a. Congruence - The task specified in the item corresponds directly to the performance specified in the objective, including the situation, action, object, and limits.

   b. Comprehensibility - The item-specified task is so stated or portrayed that the learner clearly understands what is expected of him.

   c. Objectivity - The exercise (including component items, if any) is stated in such a way that all competent observers (evaluators) can make a clear and unequivocal decision as to whether or not the learner has demonstrated an acceptable performance.

   d. Integrity - The exercise is structured in such a way that an acceptable response to the exercise constitutes sufficient evidence, in and of itself, that the learner has accomplished the corresponding objective.

   e. Equivalence - If two or more exercises correspond to a single objective, each exercise in the set would be a true alternate, in that a student who passes (or fails) one exercise on a given occasion would be expected to pass (or fail) any other exercise in the set.

3. Domain - A group of job titles which are closely related according to Vocational Education and Occupations, U. S. Department of Health, Education, and Welfare and U. S. Department of Labor, U. S. Government Printing Office, 1969.

4. Domain of Interest - The total content covered by a subject or occupation. Domain charts, as they become a part of a task analysis, provide the limits within which the performance objectives and criterion-referenced test exercises are developed.

5. Incumbent Worker - A person who participates in the survey of incumbent workers in business and industry, who holds a specific job at that particular time.

6. Instructional System - An integrated combination of resources (students, instructors, materials, equipment, and facilities), techniques, and procedures performing efficiently the functions required to achieve specified learning objectives.

7. Instructional System Development - A deliberate and orderly process for planning and developing instructional programs which insure that personnel are taught the knowledges, skills, and attitudes essential for successful job performance. This process is also known as Instructional System Engineering and Systems Approach to Training.

8. Job - The composite of duties and tasks actually performed by an individual.

9. Job Inventory - A listing of all tasks to be performed. A composite listing of job performance requirements and standards.

10. Job Performance Requirement or Standard - The tasks required of the human component of a system, including the associated standard of performance.

11. Occupational Analysis - The process of identifying duties and tasks which comprise workers, responsibilities, including the collection, collation, and analysis of such data.

12. Performance Objective - A performance objective is a statement in precise, measurable terms of a particular behavior to be exhibited by the learner under specified conditions. It possesses each of the elements or characteristics specified below:

    a. Situation - The situation confronting the learner is clearly specified, including the mode in which stimuli are to be presented.

    b. Action - The action required of the learner is unambigously defined, including the mode in which responses are to be made.

    c. Object - The object on which the learner is to operate (i.e., the object of the action) is clearly stated.

    d. Limits - The particular limits associated with the activity expected of the learner are specified. (Limits may be placed on situation, action and/or object.)

    e. Measurability - The specified action is an observable rather than an inferred response.

    f. Communicability - The objective is so stated that one, and only one, interpretation of the objective is reasonably possible.

    g. Criterion - The degree of proficiency required as evidence of accomplishment by a student of the objectives is indicated. (The criterion may be indicated implicitly or explicitly. If implicit, 100% accuracy is

effectively designated. If explicit, may be appended parenthetically to the statement of the objective.)

13. Task - A unit of work activity or operation that constitutes a logical and necessary step in the performance of a duty.

14. Task Analysis - The process of analyzing job inventory data so as to determine training requirements.

(PHASE I MODEL--DEVELOPMENT PURPOSES ONLY)

PHASE I MODEL FOR USE BY THE VOCATIONAL-TECHNICAL EDUCATION CONSORTIUM OF STATES TO MANAGE THE DEVELOPMENT, PRODUCTION, DISSEMINATION, AND IMPLEMENTATION OF CATALOGS OF PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES IN OCCUPATIONAL EDUCATION

INTRODUCTION

The following model is the result of a study of seven other models: those used by the Air Force Training Command, the State of Florida, the State of Michigan, the State of Alabama, Project Career within the State of Massachusetts, the Educational Testing Service, and the State of Utah. Components of the model were selected by the application of criteria taken from the Agreement Form of the Vocational-Technical Education Consortium of States (V-TECS), the minutes of the ad hoc Steering Committee which formed the Consortium, and the minutes of the Board of Directors, V-TECS. Some model components were the result of additional research conducted through an exhaustive study of the literature, a computer-assisted search of the ERIC files, a computer search of journal articles, and a manual search of the Dissertation International Index.

THE PHASE I MODEL

Activity Number I
Determination of Priorities and Assignment of Catalogs

This activity is the first step for developing catalogs of performance objectives and criterion-referenced measures. The activity has three basic sub-activities which form the rationale and consensus for catalog priority identification and assignment to the member states of V-TECS.

Sub-Activity I-1--State Priority Determination

The member states study data available to them concerning manpower needs, employment opportunities, and student interest surveys to establish a priority list within the state for catalogs of performance objectives and criterion-referenced measures. A state may consider regional and national data to determine its priorities or any other information which it deems necessary or appropriate.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity I-2--Consortium Priority Determination

The Board of Directors of V-TECS will discuss, in turn, the priorities established by each member state. The purpose of this discussion is to develop a priority listing from which the member states may select and be assigned a certain number of catalogs to develop. This sub-activity is to assure that duplication does not occur and that a state has the opportunity to bargain for specific catalogs in which it has a parricular interest or for which considerable work has already been accomplished.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity I-3--Assignment and/or Selection of Catalogs

The Board of Directors makes the decision concerning the final selection and/or assignment of catalogs after state and Consortium priorities have been determined. Two primary considerations are given member states on the selection of a catalog:

(1) the state has a particular interest in a domain area
(2) the state has accomplished considerable work in a domain area which would benefit the Consortium

Catalogs assigned by the Board of Directors of the Consortium are subject to acceptance by the state involved in the assignment

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity I-__--_____

(Add additional sub-activity(ies) you recommend. Attach additional pages or write on the back of the page if you desire to recommend more than one additional sub-activity.)

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SEQUENCE RESPONSE (Complete during Step Two)

Activity I is ☐ properly ☐ improperly sequenced. If improperly sequenced, I recommend this Activity follow Activity _____.

Activity Number II
The Memorandum of Agreement

A Memorandum of Agreement is entered between the state selecting or being assigned a catalog to develop and the Consortium. The parties of the Memorandum of Agreement are the Chairman of the Board of Directors of V-TECS, the Executive Director of V-TECS and the person designated by the State's Plan for Vocational Education as the State Director of Vocational Education. This activity has two sub-activities which must be completed prior to the developmental work on a catalog. Sub-activity II-1 identifies the minimum content, and sub-activity II-2 outlines the process of approval of the Memorandum of Agreement.

Sub-Activity II-1--Minimum Contents of the Memorandum of Agreement

The Memorandum of Agreement will be developed by the Consortium staff and, after a period of time, will be standardized. The Memorandum of Agreement will contain the following minimum items:

(1) date and name of catalog domain area
(2) designated signature blanks
(3) specific delivery dates for:
    (a) domain study and task lists
    (b) task analysis and survey results
    (c) catalog of performance objectives and criterion-referenced measures

(d) field test period
(e) final catalog and field test results

(4) responsibilities of a full-time technical coordinator in the state and to the Consortium

(5) Consortium staff involvement in the development of catalogs and the development of in-service training and dissemination plans.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity II-2--Processing the Memorandum of Agreement

The Memorandum of Agreement will take the following course for development and approval:

(1) format developed and prepared by the Consortium staff
(2) Memorandum of Agreement reviewed and signed by the Chairman of the Board of Directors and the Executive Director of V-TECS
(3) Memorandum of Agreement mailed to the states for review and signature by the State Director of Vocational-Technical Education
(4) designated copies distributed and project starts

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity II-__--_____

(Add additional sub-activity(ies) you recommend. Attach additional pages or write on the back of the page if you desire to recommend more than one additional sub-activity.)

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_____

SEQUENCE RESPONSE (Complete during Step Two)

Activity II is ☐ properly, ☐ improperly sequenced. If improperly sequenced, I recommend this Activity follow Activity ____.

Activity Number III
Domain Study

The domain study consists of thorough and organized research of what has been developed in performance objectives and criterion-referenced measures which might be appropriate and helpful during the development of a catalog. A domain consists of a broad instructional area (such as automotive mechanics) and should include appropriate job titles (e.g., automotive tune-up mechanic, service station mechanic, service station attendant, front end and brake mechanic, general automotive mechanic). Activity III consists of at least four sub-activities:

Sub-Activity III-1--State-of-the-Art Study

This activity increases the probability that Consortium projects will find material which has already been partially or fully developed by others in a domain area. The state-of-the-art study will include the following research activities:

(1) a search of the ERIC system for germane information
(2) a search of the journal index of ERIC for germane articles
(3) inquiries to the U. S. Office of Education, National Center for Curriculum Development in Occupational Education
(4) selected insuiries to state departments of education for germane material
(5) inquiries to industrial and private training institutions
(6) review of the Dissertation Abstract International index.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity III-2--Task List Development

A comprehensive list of tasks performed by the incumbent worker will be developed as a part of the domain study. The task list will be based upon research completed in the state-of-the-art study (sub-activity III-1) and, in addition, will include the following:

(1) a job structure arranged from the lowest job titles to the highest job title within a domain
(2) a coding system applied to the job structure
(3) development of a task list using the following sources for obtaining task statements:
    (a) review of technical procedures used by workers
    (b) identification of existing task lists or statements from technical manuals and germane literature
    (c) use of craft committees and selected committees of instructors to identify incumbent worker tasks
    (d) provision of space for a survey of incumbent workers to add task statements not included on the list

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity III-3--Development of Background Information

This part of the domain study will be used in conjunction with the task list to provide data which may be cross-tabulated and studied with the companion task lists. The background information section will include as a minimum:

(1) information about the incumbent worker and/or supervisor
    (a) name and address of incumbent worker
    (b) date survey completed by incumbent worker
    (c) job title or classification
    (d) years and months of experience in career field
    (e) years and months of experience in present job title or classification
    (f) previous vocational-technical training
    (g) private or public school attendance
    (h) highest grade level completed or GED equivalent
(2) information about job satisfaction
(3) information about utilization of talents and prior training
(4) list of equipment and tools used in the jobs of the domain
(5) type of work environment of the incumbent worker

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity III-4--Reports of the Domain Study

The following reports will be required of the domain study activity: (1) state-of-the-art study: This report includes the methods used to meet the requirements of sub-activity III-1, (a), (b), and (c) of the model; (2) background information and task list: This report includes a comprehensive section on background data to be completed by all incumbent workers who are surveyed. Following this section will be a comprehensive task listing which each incumbent worker will be asked to verify in his job classification. He will also be given the opportunity to add any task he is performing which is not included. The background information and task lists will be printed, in booklet form, in a standard format set by the Consortium staff and approved by the Board of Directors.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity III-__--_____

(Add additional sub-activity(ies) you recommend. Attach additional pages or write on the back of the page if you desire to recommend more than one additional sub-activity.)

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SEQUENCE RESPONSE (Complete during Step Two)

Activity III is ☐ properly ☐ improperly sequenced. If improperly sequenced, I recommend this Activity follow Activity ____.

Activity Number IV
Development and Implementation of the Domain Sampling Technique for the Task Statement Survey

The purpose of this activity is to obtain a sample of incumbent workers by a domain area and collect certain information from those sampled to be used later in a task analysis. Survey booklets of task statements are developed and printed using a standard format for the background and task statement information. The sampling design would be developed by an independent agency. This activity is divided into three sub-activities dealing with the sample design, sample administration, and processing of the survey results. Alternative procedures are included as a part of sub-activity IV-1 and sub-activity IV-2.

Sub-Activity IV-1--Design of the Sample

(a) Optimum sample design--The optimum sample design consists of administration of the task statement survey to stratified random sampling of incumbent workers holding a job classified within the domain. The base data to be used in determining the sample size will be the occupational information (coded from the Dictionary of Occupational Titles) collected during the 1970 Census of the United States. The body of the information collected will be statistically analyzed with inferences made to the population. (All workers in the United States in a given job classification within a specific domain.)

(b) Alternative sample design #1--The alternative sample design #1 collects information using the same base data as in IV-1(a) but limits the sample to the member states of the Consortium and makes no inferences beyond those states surveyed.

(c) Alternative sample design #2--The alternative sample design #2 collects information using the same base data as in IV-1(a) but limits the sample to the state which is developing a task survey in a particular domain. A purposive sample could be used by any state desiring to validate task lists within a state not included in the survey.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity IV-2--Administration of the Task Statement Survey

(a) Optimum administration--The optimum administration of the survey would be conducted through a central staff in the Consortium office. This would permit control of the follow-up letters, follow-up telephone calls, and general sequence timing of the surveys. Limitations exist in the application of the optimum administration which are proportionate to the activities selected in sub-activity IV-1.

(b) Alternative administration--An alternative method of administration would be to have each state which develops the task statement lists also conduct the survey of incumbent workers based upon the selection of the sample design in sub-activity IV-1. This method is based upon a thorough development of a sampling administration criteria which will be used in the survey efforts.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity IV-3--Processing the Survey Results

The results of the survey will be keypunched or optical scanned and computerized. Various analyses will be made of the data to make decisions about tasks performed by incumbent workers. These survey results are the basis for writing performance objectives and criterion-referenced test items. The analysis would be accomplished by using computer programs designed by the Air Force for this purpose.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity IV-__--_____

(Add additional sub-activity(ies) you recommend. Attach additional pages or write on the back of the page if you desire to recommend more than one additional sub-activity.)

_____

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_____

_____

SEQUENCE RESPONSE (Complete during Step Two)

Activity IV is ☐ properly, ☐ improperly sequenced. If improperly sequenced, I recommend this Activity follow Activity ____.

Activity Number V
Task Analysis System

The backbone of the Phase I Model is the system used to develop scientific task analysis information based upon a direct survey of incumbent workers. This effort should affect the quality, realism, and scope of the catalogs of performance objectives. The basic source document for the task analysis system is the task statement survey and background information collected from the incumbent worker. Activity Number V has five basic sub-activities which make up the system of task analysis. These sub-activities have to do with computed indices of task time-spent, task difficulty, task criticality, task perishability, and computer analysis and reporting.

Sub-Activity V-1--Task Time-Spent Index

The incumbent worker completes the background information and checks the tasks he actually performs in the task statement booklet. After checking the task statement, the incumbent worker rates the relative amount of time spent on the task along a seven-point scale. The response on the scale is converted to a time-spent index based on percentages over the total group of task statements checked. The resulting percentage figure is cumulative to 100 percent on all tasks checked. This conversion of information and calculations is accomplished by use of a computer.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity V-2--Task Criticality Index

The incumbent worker rates a task in terms of its critical performance. The primary interest of this part of the task analysis is to ascertain by use of a seven-point scale the relative critical values of each task. When obtained, the index of criticality can be applied to the development of performance objectives. A thorough review of this critical index will identify the tasks which are most critical in descending order to those which are considered least critical. On the basis of these data, determination can be made regarding the consequences of a poor performance of the critical tasks.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity V-3--Task Difficulty Index

The same process is used to calculate an index of task difficulty which is used in the determination of the time-spent index. A seven-point scale is again employed to determine the incumbent worker's perception of task difficulty. One additional step is included to determine the task difficulty index. The task statement survey is also administered to the immediate supervisor of the incumbent worker. The responses are then correlated, and the resulting figure becomes the difficulty index.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity V-4--Task Perishability Index

The same sampling technique and incumbent workers are used to obtain a perishability index. This index is a measure, on a seven-point scale, of the relative perishability of a task statement currently being performed by the incumbent workers participating in the survey. This index will relate to the need for retraining or refresher courses should the worker not perform, on a continuous basis, those tasks which are rated to have high indices of perishability. One implication of this type of index is to provide guidance for development of self-paced instructional packages which have as a basis the tasks which have the higher perishability indices. Retraining and development of materials could be minimized by not including objectives for tasks which do not tend to perish.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Aub-Activity V-__--_____

(Add additional sub-activity(ies) you recommend. Attach additional pages or write on the back of the page if you desire to recommend more than one additional sub-activity.)

_____

_____

_____

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SEQUENCE RESPONSE (Complete during Step Two)

Activity V is ☐ properly, ☐ improperly sequenced. If improperly sequenced, I recommend this Activity follow Activity ____.

Activity Number VI
Technical Preparation of Staff and State Coordinators

The technical preparation and training of the Consortium staff and the technical coordinators in the states are paramount to maintaining quality control. A program of technical development will begin with an orientation to the model to insure that technical skills and knowledge are sufficiently developed to provide maximum quality control. This activity is divided into five sub-activities which form the basis for staff preparation and training and are as follows:

Sub-Activity VI-1--System Orientation

A program designed to insure the performance of Consortium staff and technical coordinators will be administered. The orientation is in performance terms with each person satisfactorily completing the required tasks at a criterion-based performance level. Orientation to the system will not be considered complete until the performance standards are met by the Consortium staff and the technical coordinators.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity VI-2--Interpretation of Task Analysis Data

An intensive training plan will guide the preparation of Consortium staff and personnel within the states to effectively utilize the data from the task analysis system. This training will assist personnel in the determination of index measures of tasks which are sufficiently high to use in a catalog. Optimum index rating scores will be developed when experience demonstrates that such a rating is feasible. Any tasks which fall below the desired index rating or combination of indice ratings will be excluded from conversion to performance objectives. Continuous training will be conducted for personnel as the task analysis system develops and the analysis of the research indicates a need for further training.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity VI-3--Developing Skills in Writing Performance Objectives

Workshops, seminars, and conferences will focus on the development of skills needed to write performance objectives. Consortium staff and technical coordinators will be expected to demonstrate their ability to take a given set of task statements and data and develop written performance objectives.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity VI-4--Preparing Criterion-Referenced Test Items

Following the training of the staff and technical coordinators in the skills of writing performance objectives from task analysis data and task statements, intensive efforts will be introduced to develop companion criterion-referenced test item(s) for each performance objective. A task statement will yield one or more performance objectives, and a performance objective will yield one or more criterion-referenced test items. Test writing experts will serve as consultants for training Consortium staff and state technical coordinators. Personnel will either be sent to the source of technical expertise or the experts will be assembled in conference, seminar, or workshop settings.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity VI-5--Monitoring and Quality Control of Personnel, Education, and Training

The Consortium staff and state technical coordinators will develop individual plans of technical preparation for themselves under guidelines developed by the Board of Directors of V-TECS. These plans would serve as a guide to insure minimum competence levels of personnel of the Consortium staff and within the states. The Executive Director of the Consortium has the ultimate responsibility for monitoring individual training programs of the Consortium staff and state technical coordinators in the states. The Board of Directors will receive at least a biannual

status report of the technical preparation activities designed for individual Consortium staff and technical coordinators within the states. Reports of this nature may be requested any time the Board of Directors desires to know the status of the total plan or individual progress of personnel.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity VI-__--_____

(Add additional sub-activity(ies) you recommend. Attach additional pages or write on the back of the page if you desire to recommend more than one additional sub-activity.)

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SEQUENCE RESPONSE (Complete during Step Two)

Activity VI is ☐ properly, ☐ improperly sequenced. If improperly sequenced, I recommend this Activity follow Activity ___.

Activity Number VII
Development of Catalogs of Performance Objectives and Criterion-Referenced Measures

The activities subsequent to Activity VII have emphasized primarily: the training and preparation of personnel, the collection and analysis of information, and other preliminary steps necessary to write and catalog performance objectives and criterion-referenced measures. This activity is the application stage of the model. Information from incumbent workers is combined with the knowledge of selected

instructors, curriculum specialists, criterion-referenced test designers, and educational researchers to transpose the resulting data into meaningful test items. Activity VII contains five sub-activities designed to accomplish this task and are as follows:

Sub-Activity VII-1--Selection of a Project Director

Each state developing a catalog of performance objectives and criterion-referenced measures will select a person to serve as project director. The project director selects and manages writing teams which are composed of selected instructors in the domain being developed. These writing teams are trained by the project director and state technical coordinator to analyze the data resulting from the task analysis system, the findings of the state-of-the-art study, and other pertinent information. The project director is responsible for submitting to the state coordinator results of studies and analyses of data, catalogs of performance objectives and criterion-referenced measures, and other products required by the Memorandum of Agreement, Activity II.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity VII-2--Selection and Preparation of the Writing Teams

(1) Selection of Writing Teams--The project director and technical coordinator screen possible writing team candidates and select those instructional personnel which they determine have the potential and interest to write performance objectives and criterion-referenced measures. The writing team will consist of a minimum of two instructors, one person having knowledge and experience in developing criterion-referenced measures and one person having either local or state supervisory responsibility over the domain being developed. Each writing team should have a preferred alternate member who has responsibility in curriculum development at the local or state level.

(2) Preparation of Writing Teams--The technical coordinator will have the primary responsibility of assisting the project director in the training of the writing team members. The total design of the model will be explained--the results of the state-of-the-art study, the task analysis system, and the conversion process from task statements to performance objectives. Companion criterion-referenced measures will be prepared for each performance objective incorporating performance standards which are used on the job when these standards are available.

Components of the training program developed for the Consortium and state technical coordinators will be used as the basis for training and preparing the writing teams for their tasks.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity VII-3--Writing Performance Objectives

All performance objectives developed by the writing teams will meet the definitions and quality criteria set forth in the Memorandum of Agreement. The components of the performance objective will contain the following requirements: situation confronting the learner, action required of the learner, object on which learner is to operate, limits of performance, measurability of the action, communicability of the objective, and degree of proficiency required of the learner.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity VII-4--Preparing Criterion-Referenced Measures

Each performance objective will have one or more companion criterion-referenced test items to be used by instructional personnel. The test items will be studied to insure that a definite relationship exists between the criterion-referenced item and the standard of performance stated in the performance objective. The definition and components of an acceptable criterion-referenced measure are spelled out in the Memorandum of Agreement and will include: congruence with the performance objective, comprehensibility (expressed at a proper reading level for the level of the training program), objectivity of the test item, integrity expressed in terms of sufficient evidence that the learner can perform the corresponding objective, and equivalence within the test items. The criterion-referenced test items will be developed by the writing teams which develop the performance objectives under the technical direction of the person on the team with test item experience, the director of the project, the technical coordinator in the state, and the technical specialist on the Consortium staff.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity VII-5--Developing the Catalog of Performance Objectives and Criterion-Referenced Measures

The performance objectives and criterion-referenced measures will be coded by job classification within the domain being developed. This coding system will be developed by the Consortium and applied to all products of the Consortium. Catalog format and content are outlined in detail and are available through the technical coordinator in each state. All catalogs will be furnished in final draft form (camera ready) for mass production.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity VII-__--_____

(Add additional sub-activity(ies) you recommend. Attach additional pages or write on the back of the page if you desire to recommend more than one additional sub-activity.)

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SEQUENCE RESPONSE (Complete during Step Two)

Activity VII is ☐ properly, ☐ improperly sequenced. If improperly sequenced, I recommend this Activity follow Activity ____.

Activity Number VIII
Field Testing and Commonality Study

This activity is designed to determine the instructional validity of the performance objectives and criterion-referenced measures. The degree of validity will be determined by analysis of teacher and instructor responses to questions during the field test portion of each project. Field test sites and conditions will be selected by the application of a criterion developed by the Board of Directors, Consortium staff, and technical coordinators. Activity VIII consists of two sub-activities as follows:

Sub-Activity VIII-1--Field Testing Design

The field test is designed to control the variables under which the catalogs will be tried by teachers and instructors. Controls are placed upon the selection of the site of field testing, supervisory and administrative support and interest, instructor or teacher interest and ability, type of facilities and equipment, and level of students (junior high schools, secondary, post-secondary, etc.) The primary emphasis is placed upon determining comprehensibility, utility, and appropriateness for instruction as perceived by the teachers and instructors. Constraints which prevent the use of a given performance objective and companion criterion-referenced measures are identified by the instructional personnel.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity VIII-2--Commonality Review

During the field test, several reviews of performance objectives are made by teachers and instructors for the purpose of identifying the common performance objectives across a wide group of occupational education programs. This commonality study identifies those common performance objectives within the catalog which are applicable in several occupational domains. The common core identified is analyzed for implications for curriculum design in general shop, pre-vocational, and comprehensive career education programs.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity VIII-__--_____

(Add additional sub-activity(ies) you recommend. Attach additional pages or write on the back of the page if you desire to recommend more than one additional sub-activity.)

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SEQUENCE RESPONSE (Complete during Step Two)

Activity VIII is ☐ properly, ☐ improperly sequenced. If improperly sequenced, I recommend this Activity follow Activity ____.

Activity Number IX
Computerized Performance Objectives and Criterion-Referenced Measures

The primary purpose of this activity is to provide immediate response to the states' requests for catalogs. The computer banking of performance objectives and criterion-referenced measures eliminates the time consuming and costly step of technical editing each time a catalog is revised and updated. Since only those objectives actually changed will be accessed from the computer, the majority remain unchanged and may be retrieved and printed in the same manner each time. Research capabilities, as well as many management possibilities, exist when the computer is used to do time-consuming calculations, compiling, and cataloging of performance objectives and criterion-referenced measures. This activity contains three sub-activities as follows:

Sub-Activity IX-1--Developing Computer Bank of Performance Objectives and Criterion-Referenced Measures

After field testing, the catalogs of performance objectives and criterion-referenced measures are processed and placed in a computer bank for rapid retrieval. The coding system adopted by the Consortium is the key to the retrieval system for the computerized information. The information is arranged so that it may be retrieved by domain area or any coded job within a domain. A member of the Consortium may request the total catalog or any of its sub-parts for use in curriculum design and curriculum building. Information is recorded concerning the perceptions of the teachers and instructors during the field test and commonality review. These perceptions concern the comprehensiveness, utility, and appropriateness of the performance objectives and criterion-referenced measures for instruction. In addition, the perceptions concerning the commonality of performance objectives, across several programs in occupational education, are collected for analysis.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity IX-2--Research Aspects of the Computerized Performance Objectives and Criterion-Referenced Measures

(1) Field Test Data--Information collected during the field test activity is analyzed by the computer. The purpose of this analysis is to identify those performance objectives and criterion-referenced measures which appear to be defective. When the defective objectives and measures have been identified, they are forwarded to the state which developed the catalog with instructions for removing the possible defects.

(2) Commonality Review--The results of the commonality review by teachers and instructors form the basis for the identification of core performance objectives. This common core provides a basis for planning curriculum for pre-vocational, general shop, related subjects, and career education programs. These common performance objectives provide a framework for prerequisite skills, knowledge, and abilities needed by students to further their preparation for employment at a higher level.

(3) Cross-analysis Research--Computer programs will be utilized which cross-tabulate and cross-analyze data received from teachers and instructors with data collected from the task analysis based upon surveys of incumbent workers and their immediate supervisors. The research implications of these data are unlimited when incorporated into the Revision and Updating Activities of the model.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity IX-3--Management of Performance Objectives and Criterion-Referenced Measures

The application of a code number to each performance objective, which relates it to a specific domain and, within the domain, to a specific job classification, provides an added degree of manageability. The performance objectives will be retrieved from the computer bank by job classification, by total domain, by commonality elements, or other mixes required for planning various training programs. The computer can be used to compile the catalog by printing out performance objectives in any desired structure or sub-structure within a domain. Training programs for a new or expanding industry may be designed and retrieved from the computer and can provide those performance objectives which correlate with the job structure of the new industry. The resulting performance objectives provide a realistic planning base for curriculum which must be tailor-made for the task at hand. Many other curriculum management advantages can be developed upon this computer bank of performance objectives. The curriculum design implications are limited only by financial resources and human ingenuity.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity IX-__--_____

(Add additional sub-activity(ies) you recommend. Attach additional pages or write on the back of the page if you desire to recommend more than one additional sub-activity.)

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SEQUENCE RESPONSE (Complete during Step Two)

Activity IX is ☐ properly, ☐ improperly sequenced. If improperly sequenced, I recommend this Activity follow Activity ____.

Activity Number X
In-Service Education and Dissemination Plans

Each state using the materials of the Consortium will develop a comprehensive plan for disseminating the catalogs of performance objectives and criterion-referenced measures. In addition, a comprehensive in-service training program must be developed which is designed to prepare both instructional personnel and supervisory personnel in the techniques of managing performance-based instruction. Performance-based instruction requires a thorough knowledge and new skills for teachers and their managers if it is to achieve the desired results. This activity contains sub-activities which are directed toward the achievement of an acceptable degree of implementation of performance-based instruction in the classrooms, laboratories, and shops of participating states.

Sub-Activity X-1--In-Service Education

A requirement of Consortium membership is the development, by each state, of an in-service education program for teachers and managers of teachers who will begin to use the catalogs of performance objectives and criterion-referenced measures. The in-service program should be designed to instruct personnel on the intention of the catalog, how to select performance objectives and criterion-referenced measures, and how to supplement their selection with curriculum materials and student learning activities. Those who supervise, direct, or administer programs and have direct contact with the teacher who will be using the material should be trained in the management aspects of performance-based instruction. The specific requirements of the in-service education plan are developed and/or modified by the Board of Directors of V-TECS.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity X-2--Dissemination of Materials

A dissemination outline to be developed by the Board of Directors of V-TECS should serve as a guide for the states. The specific methods of dissemination are left entirely to the participating states. The Consortium staff will assist the states as needed and will encourage the dissemination plan to be integrated with the in-service education plan when at all possible. This integration should insure proper preparation of the users and managers of the learning process and, at the same time, provide a logical point of dissemination.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity X-__--_____

(Add additional sub-activity(ies) you recommend. Attach additional pages or write on the back of the page if you desire to recommend more than one additional sub-activity.)

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SEQUENCE RESPONSE (Complete during Step Two)

Activity X is ☐ properly, ☐ improperly sequenced.

If improperly sequenced, I recommend this Activity follow Activity ____.

Activity Number XI
Revision and Updating of the Catalogs

The rapid rate of change in a technical society mandates a better way of keeping vocational-technical instructional materials up-to-date; but, more importantly, it mandates keeping them relevant to the needs of

a modern job structure. This activity is designed to maximize input from instructional personnel, craft advisory committees, and the incumbent worker so that catalogs may be revised on a scientific and as-needed basis. This activity contains four sub-activities which form a cycle for revising and updating the catalogs. The cycle will take approximately three years to complete with a decision to revise and update or not to revise and update at the eighteen-month point in the cycle.

Sub-Activity XI-1--Field Utilization Study

Continuous field study is made regarding the catalogs of performance objectives and criterion-referenced measures. The purposes of the field study are to: (1) detect the defective performance objectives and criterion-referenced measures, (2) identify additional performance objectives which may need to be added to the catalog when it is revised, (3) obtain a wider participation in the developmental activities, particularly in the curriculum materials development.

The field utilization study has two major components for achieving the purposes:

(1) Teacher and Instructor Input--During the first year of use, the teacher is asked to react to questions concerning readability, comprehensibility, specificity, and appropriateness of performance objectives and criterion-referenced measures. This information is added to the body of data already existing on the performance objective as a result of the commonality study and the field test results.

(2) Craft Advisory Committee Input--Early in the second year, the craft advisory committee for the program using the material reviews each performance objective and responds to questions concerning (a) the utility of the performance objective, (b) the appropriateness for present job requirements, (c) the extent to which the performance objective is accomplished by entry level employees, relatively experienced employees, and experienced employees, and (d) the relative criticality of the performance objective.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity XI-2--Analysis of Data from Field Utilization Study

The information collected from the field utilization study is computerized, and reports are developed to determine the results. Statistical analysis is applied to the data to accomplish the purposes of the field utilization study. Data are compared with the results of sub-activity XI-3, survey of incumbent workers, for the purpose of deciding whether the catalog should be revised and updated or if it is still sufficiently valid for continued use.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity XI-3--Conducting New Task Analysis

The same procedure used in Activity V, task analysis system, is used at the fifteen-month point in the revision and updating cycle. The same task statements are used with the exception that those added by incumbent workers on the initial survey are included for this survey application.

Additional information requested of the incumbent worker is that he add any tasks he is now doing which do not appear on the list and place an asterisk by those task statements which he has begun to perform for the first time during the last twelve months.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity XI-4--Decision Criteria for Revising and Updating

The information collected on the new task analysis is computerized and analyzed. The purpose of the analysis is to determine the extent of new tasks identified by incumbent workers which have been accomplished the first time during the immediate past twelve months. A review of the results of the field utilization study (sub-activity XI-1) and the survey of incumbent workers forms the basis for the decision regarding the need for revision and updating of the catalogs. If the data suggest a need

for revision, the catalogs are put through the same process as for their initial development.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity XI-__--_____

(Add additional sub-activity(ies) you recommend. Attach additional pages or write on the back of the page if you desire to recommend more than one additional sub-activity.)

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SEQUENCE RESPONSE (Complete during Step Two)

Activity XI is ☐ properly, ☐ improperly sequenced. If improperly sequenced, I recommend this Activity follow Activity ____.

Activity Number XII
Third Party Evaluation of the Vocational-Technical Education Consortium of States

Evaluation of the Consortium on a biennial basis is considered desirable by the Board of Directors of V-TECS. A group of third party evaluators will be selected on a low bid basis to come into the organization to evaluate and review the processes being used. This type of review has important advantages and will serve as a basis for self-renewal. This activity contains three sub-activities which are as follows:

Sub-Activity XII-1--Selection of the Evaluation Team

The Board of Directors of V-TECS will identify on a low bid basis a third party evaluator from states outside the membership to evaluate and make recommendations concerning the total organization and its procedures. This evaluation shall occur within the first two years of the operation and every two years thereafter. The Board of Directors selects and employs the evaluators and sets broad guidelines for their study.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity XII-2--The Evaluation and Report of Results

The evaluation is conducted by a team named by the Board of Directors. The chairman of the team is selected by the Board of Directors. The results of the evaluation are forwarded to the Chairman of the Board of Directors of V-TECS with a copy transmitted concurrently to the Director of the Southern Association of Colleges and Schools, the Executive Secretary of the Commission on Occupational Education Institutions, and the Executive Director of V-TECS.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity XII-3--Implementation of the Recommendations of the Evaluation

The Board of Directors of V-TECS reviews the evaluation results and directs the implementation of the recommended changes as it deems necessary and expedient. The administering agency files its responses to the Board of Directors for consideration prior to implementation of recommendations made by the evaluation team.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity XII-_____

(Add additional sub-activity(ies) you recommend. Attach additional pages or write on the back of the page if you desire to recommend more than one additional sub-activity.)

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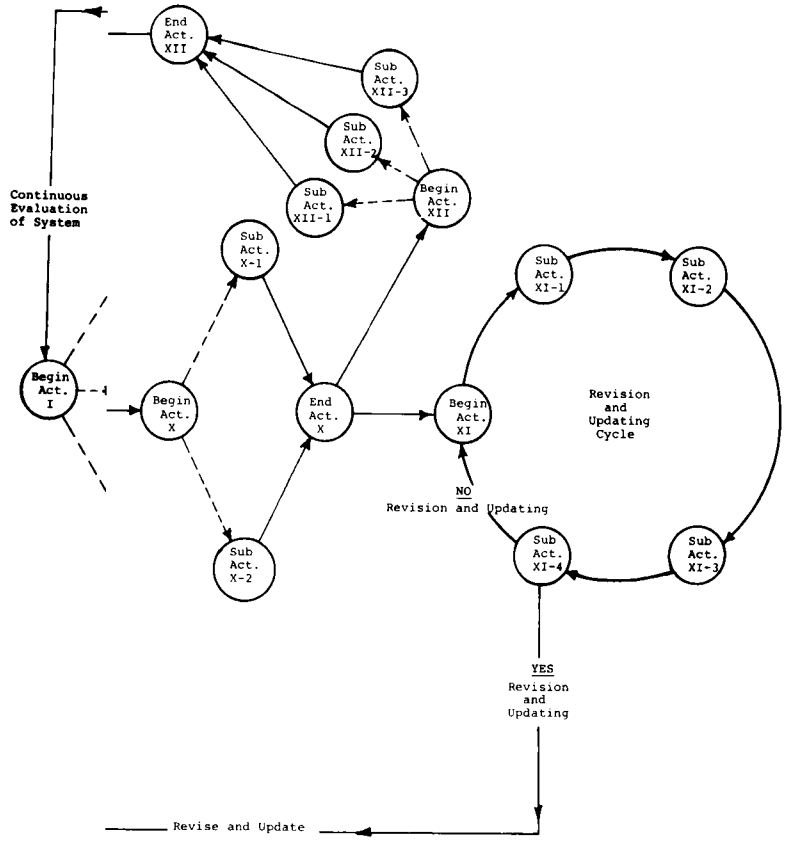
SEQUENCE RESPONSE (Complete during Step Two)

Activity XII is ☐ properly, ☐ improperly sequenced. If improperly sequenced, I recommend this Activity follow Activity ____.

ATTACHMENT A

Step II

Master Sequence Chart for the Phase I Model



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III. DOMAIN
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X. IN-SERVICE EDUCATION AND DISSEMINATION PLANS
X-1. IN-SERVICE EDUCATION
X-2. DISSEMINATION OF MATERIALS

XI. REVISION AND UPDATING OF THE CATALOGS
XI-1. FIELD UTILIZATION STUDY
XI-2. ANALYSIS OF DATA FROM FIELD UTILIZATION STUDY
XI-3. CONDUCTING NEW TASK ANALYSIS SURVEY
XI-4. DECISION CRITERIA FOR REVISING AND UPDATING CATALOGS

XII. THIRD PARTY EVALUATION OF THE VOCATIONAL-TECHNICAL EDUCATION CONSORTIUM OF STATES
XII-1. SELECTION OF THE EVALUATION TEAM
XII-2. THE EVALUATION AND REPORT OF RESULTS
XII-3. IMPLEMENTATION OF THE RECOMMENDATIONS OF THE EVALUATION

FIG

APPENDIX I

SOUTHERN ASSOCIATION OF COLLEGES AND SCHOOLS

Commission on Occupational Education Institutions

Vocational-Technical Education Consortium of States

PHASE I MODEL FOR USE BY THE VOCATIONAL-TECHNICAL EDUCATION CONSORTIUM OF STATES TO MANAGE THE DEVELOPMENT, PRODUCTION, DISSEMINATION, AND IMPLEMENTATION OF CATALOGS OF PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES IN OCCUPATIONAL EDUCATION

A Research Project
Conducted by
Ben A. Hirst, Jr.
September, 1973

INSTRUCTIONS

The Phase I Model has been developed through an extensive review of seven models and an exhaustive review of the related literature. The development of the Phase II Model, which will be considered by the Vocational-Technical Education Consortium of States, depends upon your expert opinion and perception regarding the content of the activities and sub-activities and their sequential relationship to each other.

This second Delphi probe requires up to four responses which are explained and demonstrated below in two steps:

First Step--Lay aside Attachment A of the model for use during the Second Step. Read the narrative portion of the model and review the response to the relative importance of each sub-activity. Note that these are pre-marked. The black "X" represents the category checked by most respondents during the first Delphi probe. The red "X" indicates your response if it differs from the category checked most frequently. The primary purpose of this second Delphi probe is to provide you with an opportunity to reconsider your response in view of the most frequent response on the first probe.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☒	☐	☐	☐
SHOULD BE	☒	☐	☐	☐	☐

IS -- The row of boxes following IS should be checked at the appropriate place which represents your opinion of the importance of the sub-activity under the constraints presently known to you. (This IS response will be considered your realistic estimation of the importance.)

SHOULD BE -- The row of boxes following SHOULD BE is to be checked at the appropriate place which represents your opinion of the importance of the sub-activity without consideration of constraints known to you. (This SHOULD BE response is considered your idealistic estimation of the importance.)

If you wish to CHANGE your response, just circle the new response you desire to make at this point in time. If you wish to MAINTAIN your response, please briefly state your reason(s) for doing so. A box like the one below is provided at the end of each sub-activity for you to offer reasons for maintaining your response.

* *
* REASONS FOR MAINTAINING YOUR RESPONSE DECISION *
* _____ *
* _____ *
* _____ *
* *

During the first Delphi probe, five new activities were recommended by the jury of experts. These activities will require your response in the same manner as the first probe. They will not have a black "X" or a red "X," nor will they have a box to place reason(s) for maintaining your response.

Second Step--After completing the response as directed in the First Step, take Attachment "A" and carefully review the sequence chart. Review each activity in terms of its proper or improper sequence. Your own experience and judgment should be the criteria used to respond to the sequencing of activities. If, in your opinion, the activity is properly sequenced, then check the appropriate box. If, on the other hand, the sequencing is improper, check the appropriate box and recommend the proper sequence of the activity.

SEQUENCE RESPONSE (Complete during Step Two)
Activity VII is ☐ properly, ☐ improperly sequenced. If improperly sequenced, I recommend this Activity follow Activity ___.

GLOSSARY OF TERMS

1. Catalog - A collection of performance objectives and companion criterion-referenced test items organized by domain area and further broken down by job titles within the domain.

2. Criterion-Referenced Test Exercise - A criterion-referenced test exercise is an exercise based upon a performance objective and is designed to allow the determination of whether or not the learner has accomplished the objective. It possesses each of the characteristics specified below:

   (a) Congruence - The task specified in the item corresponds directly to the performance specified in the objective, including the situation, action, object, and limits.

   (b) Comprehensibility - The item-specified task is so stated or portrayed that the learner clearly understands what is expected of him.

   (c) Objectivity - The exercise (including component items, if any) is stated in such a way that all competent observers (evaluators) can make a clear and unequivocal decision as to whether or not the learner has demonstrated an acceptable performance.

   (d) Integrity - The exercise is structured in such a way that an acceptable response to the exercise constitutes sufficient evidence, in and of itself, that the learner has accomplished the corresponding objective.

   (e) Equivalence - If two or more exercises correspond to a single objective, each exercise in the set would be a true alternate, in that a student who passes (or fails) one exercise on a given occasion would be expected to pass (or fail) any other exercise in the set.

3. Domain - A group of job titles which are closely related according to Vocational Education and Occupations, U. S. Department of Health, Education, and Welfare and U. S. Department of Labor, U. S. Government Printing Office, 1969.

4. Domain of Interest - The total content covered by a subject or occupation. Domain charts, as they become a part of a task analysis, provide the limits within which the performance objectives and criterion-referenced test exercises are developed.

5. Incumbent Worker - A person who participates in the survey of workers in business and industry, who holds a specific job at that particular time.

6. Instructional System - An integrated combination of resources (students, instructors, materials, equipment, and facilities), techniques, and procedures performing efficiently the functions required to achieve specified learning objectives.

7. Instructional System Development - A deliberate and orderly process for planning and developing instructional programs which insure that personnel are taught the knowledges, skills, and attitudes essential for successful job performance. This process is also known as Instructional System Engineering and Systems Approach to Training.

8. Job - The composite of duties and tasks actually performed by an individual.

9. Job Inventory - A listing of all tasks to be performed. A composite listing of job performance requirements and standards.

10. Job Performance Requirement or Standard - The tasks required of the human component of a system, including the associated standard of performance.

11. Occupational Analysis - The process of identifying duties and tasks which comprise workers, responsibilities, including the collection, collation, and analysis of such data.

12. Performance Objective - A performance objective is a statement in precise, measurable terms of a particular behavior to be exhibited by the learner under specified conditions. It possesses each of the elements of characteristics specified below:

    (a) Situation - The situation confronting the learner is clearly specified, including the mode in which stimuli are to be presented.

    (b) Action - The action required of the learner is unambigously defined, including the mode in which responses are to be made.

    (c) Object - The object on which the learner is to operate (i.e., the object of the action) is clearly stated.

    (d) Limits - The particular limits associated with the activity expected of the learner are specified. (Limits may be placed on situation, action and/or object.)

    (e) Measurability - The specified action is an observable rather than an inferred response.

(f) Communicability - The objective is so stated that one, and only one, interpretation of the objective is reasonably possible.

(g) Criterion - The degree of proficiency required as evidence of accomplishment by a student of the objective is indicated. (The criterion may be indicated implicitly or explicitly. If implicit, 100 percent accuracy is effectively designated. If explicit, may be appended parenthetically to the statement of the objective.)

13. Duty - A distinct grouping of tasks which are related to each other by the nature of the work to be performed.

14. Task - A unit of work activity or operation that constitutes a logical and necessary step in the performance of a duty.

15. Task Analysis - The process of analyzing job inventory data so as to determine training requirements.

(PHASE I MODEL--DEVELOPMENT PURPOSES ONLY)

PHASE I MODEL FOR USE BY THE VOCATIONAL-TECHNICAL EDUCATION CONSORTIUM OF STATES TO MANAGE THE DEVELOPMENT, PRODUCTION, DISSEMINATION, AND IMPLEMENTATION OF CATALOGS OF PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES IN OCCUPATIONAL EDUCATION

INTRODUCTION

The following model is the result of a study of seven other models: those used by the Air Force Training Command, the State of Florida, the State of Michigan, the State of Alabama, Project CAREER within the State of Massachusetts, the Educational Testing Service, and the State of Utah. Components of the model were selected by the application of criteria taken from the Agreement Form of the Vocational-Technical Education Consortium of States (V-TECS), the minutes of the ad hoc Steering Committee which formed the Consortium, and the minutes of the Board of Directors, V-TECS. Some model components were the result of additional research conducted through an exhaustive study of the literature, a computer-assisted search of the ERIC files, a computer search of journal articles, and a manual search of the Dissertation International Index.

THE PHASE I MODEL

Activity Number I
Determination of Priorities and Assignment of Catalogs

This activity is the first step for developing catalogs of performance objectives and criterion-referenced measures. The activity has four basic sub-activities which form the rationale and consensus for catalog priority identification and assignment to the member states of V-TECS.

Sub-Activity I-1--State Priority Determination

The member states study data available to them concerning manpower needs, employment opportunities, and student interest surveys to establish a priority list within the state for catalogs of performance objectives and criterion-referenced measures. A state may consider regional and national data to determine its priorities or any other information which it deems necessary or appropriate.

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Sub-Activity I-2--Consortium Priority Determination

The Board of Directors of V-TECS will discuss, in turn, the priorities established by each member state. The purpose of this structured discussion is to develop a priority listing from which the member states may select and be assigned a certain number of catalogs to develop. This sub-activity is to assure that duplication does not occur and that a state has the opportunity to negotiate for specific catalogs in which it has a particular interest or for which considerable work has already been accomplished.

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Sub-Activity I-3--Resolution of Conflict and Exchange of Previous Work Related to Catalogs to Be Developed

Should states not be able to resolve priority preference conflicts, a drawing of assignments will be conducted by the Board of Directors. In case a state does not get its desired priority area for reasons identified by the Board of Directors, a copy of such accomplished work would be provided to the state assigned the catalog area in dispute. This material will be included as an essential part of the state-of-the-art study to eliminate duplication of effort.

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Sub-Activity I-4--Assignment and/or Selection of Catalogs

The Board of Directors makes the decision concerning the final selection and/or assignment of catalogs after state and Consortium priorities have been determined. Two primary considerations are given member states on the selection of a catalog:

(1) the state has a particular interest in a domain area
(2) the state has accomplished or has in progress considerable work in a domain area which would benefit the Consortium

Catalogs assigned by the Board of Directors of the Consortium are subject to acceptance by the state involved in the assignment.

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Activity Number II
The Memorandum of Agreement

A Memorandum of Agreement is entered between the state selecting or being assigned a catalog to develop and the Consortium. The parties of the Memorandum of Agreement are the Chairman of the Board of Directors of V-TECS, the Executive Director of V-TECS and the person designated by the State's Plan for Vocational Education as the State Director of Vocational Education. This activity has two sub-activities which must be completed prior to the developmental work on a catalog. Sub-activity II-1 identifies the minimum content, and sub-activity II-2 outlines the process of approval of the Memorandum of Agreement.

Sub-Activity II-1--Minimum Contents of the Memorandum of Agreement

The Memorandum of Agreement will be developed by the Consortium staff and, after a period of time, will be standardized. The Memorandum of Agreement will contain the following minimum items:

(1) date and name of catalog domain area including job titles to be surveyed
(2) designated signature blanks
(3) spedific delivery dates for:
    (a) domain study and task lists
    (b) task analysis and survey results
    (c) catalog of performance objectives and criterion-referenced measures
    (d) field test period
    (e) final catalog and field test results
(4) responsibilities of a full-time technical coordinator in the state and to the Consortium
(5) Consortium staff involvement in the development of catalogs and the development of in-service training and dissemination plans.

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Sub-Activity II-2--Processing the Memorandum of Agreement

The Memorandum of Agreement will take the following course for development and approval:

(1) format developed and prepared by the Consortium staff
(2) Memorandum of Agreement reviewed and signed by the Chairman of the Board of Directors and the Executive Director of V-TECS
(3) Memorandum of Agreement mailed to the states for review and signature by the State Director of Vocational-Technical Education
(4) designated copies distributed and project starts
(5) periodic PERT reports are mailed to states on request

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Sub-Activity II-3--Selection of a Project Director

Each state developing a catalog of performance objectives and criterion-referenced measures will select a person to serve as project director. The project director selects and manages writing teams which are composed of selected instructors in the domain being developed.

These writing teams are trained by the project director and state technical coordinator to analyze the data resulting from the occupational analysis system, the findings of the state-of-the-art study, and other pertinent information. The project director is responsible for submitting to the state technical coordinator results of studies and analyses of data, catalogs of performance objectives and criterion-referenced measures, and other products required by the Memorandum of Agreement. The project director will meet the same qualifications established by the Board of Directors of V-TECS for the technical coordinator in each state.

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Activity Number III
Technical Preparation of V-TECS Staff and State Coordinators

The technical preparation and training of the Consortium staff and the technical coordinators in the states are paramount to maintaining quality control. A program of technical development will begin with an orientation to the model to insure that technical skills and knowledge are sufficiently developed to provide maximum quality control. This activity is divided into five sub-activities which form the basis for staff preparation and training and are as follows:

Sub-Activity III-1--System Orientation

A program designed to insure the performance of Consortium staff and technical coordinators will be administered. The orientation is in performance terms with each person satisfactorily completing the required tasks at a criterion-based performance level. Orientation to the system will not be considered complete until the performance standards are met by the Consortium staff and the technical coordinators.

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Sub-Activity III-2--Determining Decision Criteria

The Board of Direcgors and the staff of V-TECS will develop the decision criteria to be used in the determination of tasks to be converted to performance objectives for cataloging. The decisions will be based upon cut-off indices of time-spent, difficulty, criticality, and task perishability. Other bases for decision criteria may be developed by the Board of Directors based upon research of the data resulting from the surveys of the incumbent workers and their immediate supervisors.

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Sub-Activity III-3--Interpretation of Task Analysis Data

An intensive training plan will guide the preparation of Consortium staff and personnel within the states to effectively utilize the data

from the task analysis system. This training will assist personnel in the determination of index measures of tasks which are sufficiently high to use in a catalog. Optimum index rating scores will be developed when experience demonstrates that such a rating is feasible. Any tasks which fall below the desired index rating or combination of indice ratings will be excluded from conversion to performance objectives. Continuous training will be conducted for personnel as the task analysis system develops and the analysis of the research indicates a need for further training.

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Sub-Activity III-5--Preparing Criterion-Referenced Test Items

Following the training of the staff and technical coordinators in the skills of writing performance objectives from task analysis data and task statements, intensive efforts will be introduced to develop companion criterion-referenced test item(s) for each performance objective. A task statement will yield one or more performance objectives, and a performance objective will yield one or more criterion-referenced test items. Criterion-referenced test writing experts will serve as consultants for training Consortium staff and state technical coordinators. Personnel will either be sent to the source of technical expertise or the experts will be assembled in conference, seminar, or workshop settings.

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(3) inquiries to the U. S. Office of Education, National Center for Curriculum Development in Occupational Education
(4) selected inquiries to state departments of education for germane material
(5) inquiries to industry and private training institutions
(6) review of the Dissertation Abstract International index
(7) inquiry to local education agencies identified as working on germane projects

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Sub-Activity IV-2--Task List Development

A comprehensive list of tasks performed by the incumbent worker will be developed as a part of the domain study. The task list will be based upon research completed in the state-of-the-art study (sub-activity IV-1) and, in addition, will include the following:

(1) a job structure arranged from the lowest job titles to the highest job title within a domain
(2) a coding system developed by the Consortium and identified in the Dictionary of Occupational Titles will be applied to the job structure
(3) development of a task list using the following sources for obtaining task statements:
    (a) review and observation of technical procedures used by workers
    (b) identification of existing task lists or statements from technical manuals and germane literature
    (c) interviews with incumbent workers and their immediate supervisors
    (d) use of craft committees and selected committees of instructors to identify incumbent worker tasks

(e) provision of space for a survey of incumbent workers to add task statements not included on the list

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Sub-Activity IV-4--Reports of the Domain Study

The following reports will be required of the domain study activity: (1) state-of-the-art study: This report includes the methods used to meet the requirements of sub-activity IV-1, (1), (2), and (3) of the model; (2) background information and task list: This report includes a comprehensive section on background data to be completed by all incumbent workers who are surveyed. Following this section will be a comprehensive task listing which each incumbent worker will be asked to verify in his job classification. He will also be given the opportunity to add any task he is performing which is not included. The background information and task lists will be printed, in booklet form, in a standard format set by the Consortium staff and approved by the Board of Directors.

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SEQUENCE RESPONSE (Complete during Step Two)

Activity IV is ☐ properly, ☐ improperly sequenced. If improperly sequenced, I recommend this Activity follow Activity ____.

Activity Number V
Development and Implementation of the Domain Sampling Technique for the Task Statement Survey

The purpose of this activity is to obtain a sample of incumbent workers by a domain area and collect certain information from those sampled to be used later in a task analysis. Survey booklets of task statements are developed by an independent agency. This activity is divided into three sub-activities dealing with the sample design, sample administration, and processing of the survey results. Alternative procedures are included as a part of sub-activity V-1 and sub-activity V-2.

Sub-Activity V-1--Design of the Sample

(a) Optimum sample design--The optimum sample design consists of administration of the task statement survey to stratified random sampling of incumbent workers holding a job classified within the domain. The base data to be used in determining the sample size will be the occupational information (coded from the Dictionary of Occupational Titles) collected during the 1970 Census of the United States. The body of the information collected will be statistically analyzed with inferences made to the population. (All workers in the United States in a given job classification within a specific domain.)

(b) Alternative sample design #1--The alternative sample design #1 collects information using the same base data as in V-1(a) but limits the sample to the member states of the Consortium and makes no inferences beyond those states surveyed.

(c) Alternative sample design #2--The alternative sample design #2 collects information using the same base data as in V-1(a) but limits the sample to the state which is developing a task survey in a particular domain. A purposive sample could be used by any state desiring to validate task lists within a state not included in the survey.

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Sub-Activity V-2--Administration of the Occupational Analysis Survey

(a) Optimum administration--The optimum administration of the survey would be conducted through a central staff in the Consortium office. This would permit control of the follow-up letters, followup telephone calls, and general sequence timing of the surveys. Limitations exist in the application of the optimum administration which are proportionate to the activities selected in sub-activity V-1.

(b) Alternative administration--An alternative method of administration would be to have each state which develops the task statement lists also conduct the survey of incumbent workers based upon the selection of the sample design in sub-activity V-1. This method is based upon a thorough development of a sampling administration criteria which will be used in the survey efforts. A sub-sample will be selected and individually interviewed on the work site to compare with the results of the mail-out survey.

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Sub-Activity V-3--Processing the Survey Results

The results of the survey will be keypunched or optically scanned and computerized. Various analyses will be made of the data to make

decisions about tasks performed by incumbent workers. These survey results will provide the basis for writing performance objectives and criterion-referenced test items. Indices of time-spent, difficulty, criticality, and perishability will provide the basis for strategic decision making. The analysis will be accomplished by using computer programs designed by the U. S. Air Force for this purpose.

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Sub-Activity VI-1--Task Time-Spent Index

The incumbent workers complete the background information and check the tasks they actually perform in the task statement booklet. After checking the task statement, the incumbent worker rates the relative amount of time spent on the task along a seven-point scale. The response on the scale is converted to a time-spent index based on percentages over the total group of task statements checked. The resulting percentage figure is cumulative to 100 percent on all tasks checked. This conversion of information and calculations is accomplished by use of a computer.

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Sub-Activity VI-3--Task Difficulty Index

The same process is used to calculate an index of task difficulty which is used in the determination of the time-spent index. A seven-point scale is again employed to determine the incumbent worker's perception of task difficulty. One additional step is included to determine the task difficulty index. The task statement survey is also administered to the immediate supervisor of the incumbent worker. The responses are then correlated, and the resulting figure becomes the difficulty index.

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Sub-Activity VI-4--Task Perishability Index

The same sampling technique and incumbent workers are used to obtain a perishability index. This index is a measure, on a seven-point scale, of the relative perishability of a task statement currently being performed by the incumbent workers participating in the survey. This index will relate to the need for retraining or refresher courses should the worker not perform, on a continuous basis, those tasks which are rated to have high indices of perishability. One implication of this type of index is to provide guidance for development of self-paced instructional packages which have as a basis the tasks which have the higher perishability indices. Retraining and development of materials could be minimized by including objectives for tasks which have high indices of perishability.

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Sub-Activity VI-5--Processing of Data and Development of Reports

The information collected from sub-activity VI-1-, VI-2, VI-3, and VI-4 will be computerized for statistical analysis. Information will be translated from qualitative data to quantitative data. The quantitative data will produce the index values of time spent, criticality, difficulty, and perishability. Many other statistical anslyses can be applied to the data for the purpose of rank ordering, multiple regression analyses, cross tabulation of tasks with elements and sub-elements of the background information, etc. The resulting printouts will be furnished to the state developing the catalog of performance objectives and criterion-referenced measures as a basis for their developmental activities and decision making.

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SEQUENCE RESPONSE (Complete during Step Two)

Activity VI is ☐ properly, ☐ improperly sequenced. If improperly sequenced, I recommend this Activity follow Activity ____.

Activity Number VII
Development of Catalogs of Performance Objectives and Criterion-Referenced Measures

The activities prior to Activity VII have emphasized primarily the training and preparation of personnel, the collection and analysis of information, and other preliminary steps necessary to write and catalog performance objectives and criterion-referenced measures. This activity is the application stage of the model. Information from incumbent workers is combined with the knowledge of selected instructors, curriculum specialists, criterion-referenced test designers, and educational researchers to transpose the resulting data into meaningful test items. Activity VII contains five sub-activities designed to accomplish this task which are as follows:

Sub-Activity VII-1--Selection and Preparation of the Writing Teams

(1) Selection of Writing Teams--The project director and technical coordinator screen possible writing team candidates and select those instructional personnel which they determine have the potential and interest to write performance objectives and criterion-referenced measures. The writing team will consist of a minimum of one instructor, one technical writer, one person having demonstrated ability and experience in developing criterion-referenced measures and one person having either local or state supervisory responsibility over the domain being developed. Each writing team should have a preferred alternate member who has responsibility in curriculum development at the local or state level. Exceptions to the writing team composition will be made upon request by the state developing the catalog. The request will be transmitted to the Board of Directors with appropriate justification for the exceptions. Decisions will rest with the Board of Directors.

(2) Preparation of Writing Teams--The state technical coordinator will have the primary responsibility of assisting the project director in the training of the writing team members. The total design of the model will be explained--the results of the state-of-the-art study, the task analysis system, and the conversion process from task statements to performance objectives. Companion criterion-referenced measures will be prepared for each performance objective incorporating performance standards which are used on the job when these standards are available. Components of the training program developed for the Consortium and state technical coordinators will be used as the basis for training and preparing the writing teams for their tasks.

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Sub-Activity VII-2--Writing Performance Objectives

All performance objectives developed by the writing teams will meet the definitions and quality criteria set forth in the Memorandum of Agreement. The components of the performance objective will contain the following requirements: situation confronting the learner, action required of the learner, object on which learner is to operate, limits of performance, measurability of the action, communicability of the objective, and degree of proficiency required of the learner.

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Sub-Activity VII-3--Preparing Criterion-Referenced Measures

Each performance objective will have one or more companion criterion-referenced test items to be used by instructional personnel. The test items will be studied to insure that a definite relationship

exists between the criterion-referenced item and the standard of performance stated in the performance objective. The definition and components of an acceptable criterion-referenced measure are spelled out in the Memorandum of Agreement and will include: congruence with the performance objective, comprehensibility (expressed at a proper reading level for the level of the training protram), objectivity of the test item, integrity expressed in terms of sufficient evidence that the learner can perform the corresponding objective, and equivalence within the test items. The criterion-referenced test items will be developed by the writing teams which develop the performance objectives under the technical direction of the person on the team with test item experience, the director of the project, the technical coordinator in the state, and the technical specialist on the Consortium staff. Particular emphasis would be placed upon explicit information concerning criterion of performance on-the-job and conditions under which performance occurs. Standards would be based upon those used by business and industrial workers.

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Sub-Activity VII-4--Developing the Catalog of Performance Objectives and Criterion-Referenced Measures

The performance objectives and criterion-referenced measures will be coded by job classification within the domain being developed. This coding system will be developed by the Consortium and applied to all products of the Consortium. Catalog format and content are outlined in detail and are available through the technical coordinator in each state. All catalogs will be furnished in final draft form (camera ready) for mass production.

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SEQUENCE RESPONSE (Complete during Step Two)

Activity VII is ☐ properly, ☐ improperly sequenced. If improperly sequenced, I recommend this Activity follow Activity ____.

Activity Number VIII
Field Testing and Commonality Study

This activity is designed to determine the instructional acceptability of the performance objectives and criterion-referenced measures. The degree of validity will be determined by analysis of teacher and instructor responses to questions during the field test portions of each project. Field test sites and conditions will be selected by the application of a criterion developed by the Board of Directors, Consortium staff, and technical coordinators. Activity VIII consists of two sub-activities as follows:

Sub-Activity VIII-1--Field Testing Design

The field test is designed to control the variables under which the catalogs will be tried by teachers and instructors. Controls are placed upon the selection of the site of field testing, supervisory and administrative support and interest, instructor or teacher interest and ability, type of facilities and equipment, and level of students (junior high schools, secondary, post-secondary, etc.). The primary emphasis is placed upon determining comprehensability, utility, and appropriateness for instruction as perceived by the teachers and instructors. Constraints which prevent the use of a given performance objective and companion criterion-referenced measures are identified by the instructional personnel.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☒	☐	☐	☐
SHOULD BE	☒	☐	☐	☐	☐

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* REASONS FOR MAINTAINING YOUR RESPONSE DECISION *

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Sub-Activity VIII-2--Commonality Review

During the field test, several reviews of performance objectives are made by teachers and instructors for the purpose of identifying the common performance objectives across a wide group of occupational education programs. This commonality study identifies those common performance objectives within the catalog which are applicable in several occupational domains. The common core identified is analyzed for implications for curriculum design in general shop, pre-vocational, and comprehensive career education programs.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☒	☐	☐	☐
SHOULD BE	☒	☐	☐	☐	☐

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* REASONS FOR MAINTAINING YOUR RESPONSE DECISION *

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Sub-Activity VIII-3--Evaluation of Criterion-Referenced Test Items

A jury including an incumbent worker, a criterion-referenced test item writer, an instructor in the catalog domain area, and a supervisor of the incumbent workers represented would be used to make a final review of the criterion-referenced test items. The primary purpose of this activity will be to reach congruence on the behavior being tested and to permit inference of competence should the learner meet the specified performance.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity VIII-4--Determination of Performance Objectives and Criterion-Referenced Measures Which are Applicable to Handicapped Persons

The field test version of the catalog of performance objectives and criterion-referenced test items will be reviewed by a committee of persons to determine their applicability to the training of handicapped persons. The appropriate performance objectives and criterion-referenced test item will be coded for each of the specific types of handicapped persons, i.e., partially sighted, speech defects, hard of hearing, crippled, and mentally retarded, etc. A special review committee for the handicapped will consist of a curriculum developer, an instructor from the catalog domain area and a representative of each of the handicapped groups who has the ability to determine the training limitations of handicapped persons in each group. The work of the committee will be coded and computerized for retrieval for use in planning realistic training programs for the handicapped.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

SEQUENCE RESPONSE (Complete during Step Two)

Activity VIII is ☐ properly, ☐ improperly sequenced. If improperly sequenced, I recommend this Activity follow Activity ____.

Activity Number IX
Computerize Performance Objectives and Criterion-Referenced Measures

The primary purpose of this activity is to provide immediate response to the states' requests for catalogs. The computer banking of performance objectives and criterion-referenced measures eliminates the time-consuming and costly step of technical editing each time a catalog is revised and updated. Since only those objectives actually changed will be accessed from the computer, the majority remain unchanged and may be retrieved and printed in the same manner each time. Research capabilities, as well as many management possibilities, exist when the computer is used to do time-consuming calculations, compiling, and cataloging of performance objectives and criterion-referenced measures. This activity contains three sub-activities as follows:

Sub-Activity IX-1--Developing Computer Bank of Performance Objectives and Criterion-Referenced Measures

After field testing, the catalogs of performance objectives and criterion-referenced measures are processed and placed in a computer bank for rapid retrieval. The coding system adopted by the Consortium is the key to the retrieval system for the computerized information. The information is arranged so that it may be retrieved by domain area or any coded job within a domain. A member of the Consortium may request the total catalog or any of its sub-parts for use in curriculum design and curriculum building. Information is recorded concerning the perceptions of the teachers and instructors during the field test and commonality review. These perceptions concern the comprehensiveness, utility, and appropriateness of the performance objectives and criterion-referenced measures for instruction. In addition, the perceptions concerning the commonality of performance objectives, across several programs in occupational education, are collected for analysis.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☒	☐	☐	☐
SHOULD BE	☒	☐	☐	☐	☐

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Sub-Activity IX-2--Research Aspects of the Computerized Performance Objectives and Criterion-Referenced Measures

(1) Field Test Data--Information collected during the field test activity is analyzed by the computer. The purpose of this analysis is to identify those performance objectives and criterion-referenced measures which appear to be defective. When the defective objectives and measures have been identified, they are forwarded to the state which developed the catalog with instructions for removing the possible defects.

(2) Commonality Review--The results of the commonality review by teachers and instructors form the basis for the identification of core performance objectives. This common core provides a basis for planning curriculum for pre-vocational, general shop, related subjects, and career education programs. These common performance objectives also provide a framework for prerequisite skills, knowledge, and abilities needed by students to further their preparation for employment at a higher level.

(3) Cross-Analysis Research--Computer programs will be utilized which cross-tabulate and cross-analyze data received from teachers and instructors with data collected from the task analysis based upon surveys of incumbent workers and their immediate supervisors. The research implications of these data are unlimited when incorporated into the Revision and Updating Activities of the model.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☒	☐	☐	☐
SHOULD BE	☐	☒	☐	☐	☐

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job classification, by total domain, by commonality elements, or other mixes required for planning various training programs. The computer can be used to compile the catalog by printing out performance objectives in any desired structure or sub-structure within a domain. Training programs for a new or expanding industry may be designed and retrieved from the computer and can provide those performance objectives which correlate with the job structure of the new industry. The resulting performance objectives provide a realistic planning base for curriculum which must be tailor-made for the task at hand. Many other curriculum management advantages can be developed upon this computer bank of performance objectives. The curriculum design implications are limited only by financial resources and human ingenuity.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☒	☐	☐	☐
SHOULD BE	☒	☐	☐	☐	☐

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* REASONS FOR MAINTAINING YOUR RESPONSE DECISION *

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Sub-Activity IX-4--Development of Special Reports for Training the Handicapped Learner

The information collected from the work of the special committee for the handicapped (sub-activity VIII-4) would be computerized and used as a research base for developing planning and organizing training program and activities for the handicapped learner. The performances specified in the objectives and criterion-referenced measures could be modified to permit handicapped workers to demonstrate their ability in terms of particular job titles. Other valuable research could be accomplished by using the data concerning the abilities of the handicapped and comparing it with background information from the incumbent workers and their immediate supervisors.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

SEQUENCE RESPONSE (Complete during Step Two)

Activity IX is ☐ properly, ☐ improperly sequenced. If improperly sequenced, I recommend this Activity follow Activity ____.

Activity Number X
In-Service Education and Dissemination Plans

Each state using the materials of the Consortium will develop a comprehensive model for disseminating the catalogs of performance objectives and criterion-referenced measures. In addition, a comprehensive in-service training program must be developed which is designed to prepare both instructional personnel and supervisory personnel in the techniques of managing performance-based instruction. Performance-based instruction requires a thorough knowledge and new skills for teachers and their managers if it is to achieve the desired results. This activity contains sub-activities which are directed toward the achievement of an acceptable degree of implementation of performance-based instruction in the classrooms, laboratories, and shops of participating states.

Sub-Activity X-1--In-Service for Curriculum Developers

Specific programs will be planned for preparing curriculum developers concerning the use of catalogs for organizing learning activities. These programs are to be planned jointly with Consortium staff and include a comprehensive explanation of the system used to develop catalogs, the skills required for retrieving appropriate performance objectives and criterion-referenced measures, and the management strategies necessary to implement a performanced-based curriculum effort in the classroom and laboratory. Strategies will also be included to provide direction in the organization and preparation of learning activities.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☐	☐	☐
SHOULD BE	☐	☐	☐	☐	☐

Sub-Activity X-2--In-Service Education for Teachers and Supervisors

A requirement of Consortium membership is the development, by each state, of an in-service education program for teachers and managers of teachers who will begin to use the catalogs of performance objectives and criterion-referenced measures. The in-service program should be designed to instruct personnel on the intention of the catalog, how to select performance objectives and criterion-referenced measures, and how to supplement their selection with curriculum materials and student learning activities. Those who supervise, direct, or administer programs and have direct contact with the teacher who will be using the material should be trained in the management aspects of performance-based instruction. The basic requirements of the in-service education plan are developed and/or modified by the Board of Directors of V-TECS.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☒	☐	☐	☐
SHOULD BE	☒	☐	☐	☐	☐

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SEQUENCE RESPONSE (Complete during Step Two)

Activity X is ☐ properly, ☐ improperly sequenced. If improperly sequenced, I recommend this Activity follow Activity ____.

Activity Number XI
Revision and Updating of the Catalogs

The rapid rate of change in a technical society mandates a better way of keeping vocational-technical instructional materials up-to-date; but, more importantly, it mandates keeping them relevant to the needs of a modern job structure. This activity is designed to maximize input from instructional personnel, craft advisory committees, and the incumbent worker so that catalogs may be revised on a scientific and as-needed basis. This activity contains four sub-activities which form a cycle for revising and updating the catalogs. The cycle will take approximately three years to complete with a decision to revise and update or not to revise and update at the eighteen-month point in the cycle.

Sub-Activity XI-1--Field Utilization Study

Continuous field study is made regarding the catalogs of performance objectives and criterion-referenced measures. The purposes of the field study are to: (1) detect the defective performance objectives and criterion-referenced measures, (2) identify additional performance objectives which may need to be added to the catalog when it is revised, and (3) obtain a wider participation in the developmental activities, particularly in the area of curriculum materials.

The field utilization study has two major components for achieving the purposes:

(1) Teacher and Curriculum Developer Inputs--During the first year of use, the teachers and curriculum developers will be asked to react to questions concerning readability, comprehensibility, specificity, and appropriateness of performance objectives and criterion-referenced

measures. This information is added to the body of data already existing on the performance objective as a result of the commonality study and the field test results.

(2) Craft Advisory Committee Inputs--Early in the second year, the craft advisory committees for the programs using the material review each performance objective and respond to questions concerning (a) the utility of the performance objective, (b) the appropriateness for present job requirements, (c) the extent to which the performance objective is accomplished by entry level employees, relatively experienced employees, and experienced employees, and (d) the relative criticality of the performance objective.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☒	☐	☐	☐
SHOULD BE	☒	☐	☐	☐	☐

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* REASONS FOR MAINTAINING YOUR RESPONSE DECISION *

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Sub-Activity XI-2--Analysis of Data from Field Utilization Study

The information collected from the field utilization study is computerized, and reports are developed to determine the results. Statistical analysis is applied to the data to accomplish the purposes of the field utilization study. Data are compared with the results of sub-activity XI-3, survey of incumbent workers, for the purpose of deciding whether the catalog should be revised and updated or if it is still sufficiently valid for continued use.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☒	☐	☐	☐
SHOULD BE	☐	☒	☐	☐	☐

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Sub-Activity XI-3--Conducting New Task Analysis

The same procedure used in Activity VI, task analysis system is used at the twenty-fourth month point in the revision and updating cycle. The same task statements are used with the exception that those added by incumbent workers on the initial survey are included for this survey application.

Additional information requested of the incumbent worker is that he add any tasks he is now doing which do not appear on the list and place an asterisk by those task statements which he has begun to perform for the first time during the last twelve months

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☒	☐	☐	☐
SHOULD BE	☐	☒	☐	☐	☐

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* REASONS FOR MAINTAINING YOUR RESPONSE DECISION *

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Sub-Activity XI-4--Decision Criteria for Revising and Updating Catalogs

The information collected on the new task analysis is computerized and analyzed. The purpose of the analysis is to determine the extent of new tasks identified by incumbent workers which have been accomplished the first time during the immediate past twelve months. A review of the results of the field utilization study (sub-activity XI-1) and the survey of incumbent workers forms the basis for the decision regarding the need for revision and updating of the catalogs or portions of the catalogs.

If the data suggests a need for revision, the catalogs are put through the same process as for their initial development.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☒	☐	☐	☐
SHOULD BE	☒	☐	☐	☐	☐

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* REASONS FOR MAINTAINING YOUR RESPONSE DECISION *

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SEQUENCE RESPONSE (Complete during Step Two)

Activity XI is ☐ properly, ☐ improperly sequenced. If improperly sequenced, I recommend this Activity follow Activity ____.

Activity Number XII
Third Party Evaluation of the Vocational-Technical Education Consortium of States

Evaluation of the Consortium on a biennial basis is considered desirable by the Board of Directors of V-TECS. A third party evaluator will be selected on a low bid basis from a group of competent and qualified evaluators. This type of assessment has important advantages and will serve as a basis for self-renewal. This activity contains three sub-activities which are as follows:

Sub-Activity XII-1--Selection of the Evaluation Team

The Board of Directors of V-TECS will select a qualified low bidder as a third party evaluator from states or organizations outside the membership to evaluate and make recommendations concerning the total organization and its procedures. This evaluation shall occur within the first two years of the operation and every two years thereafter. The Board of Directors selects and employs the evaluators and sets guidelines for their study. These guidelines will be used as a basis for developing a well defined and congruent request for proposals.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☒	☐	☐	☐
SHOULD BE	☐	☒	☐	☐	☐

REASONS FOR MAINTAINING YOUR RESPONSE DECISION

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Sub-Activity XII-2--The Evaluation and Report of Results

The evaluation is conducted by a team selected by the Board of Directors. The chairman of the evaluation team will be selected by the successful bidder and the members of the evaluation team. The results of the evaluation are forwarded to the Chairman of the Board of Directors of V-TECS with a copy transmitted concurrently to the Director of the Southern Association of Colleges and Schools, the Executive Sectary of the Commission on Occupational Education Institutions, and the Executive Director of V-TECS.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	☒	☐	☐
SHOULD BE	☐	☒	☐	☐	☐

REASONS FOR MAINTAINING YOUR RESPONSE DECISION

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Sub-Activity XII-3--Implementation of the Recommendations of the Evaluation

The Board of Directors of V-TECS reviews the evaluation results and directs the implementation of the recommended changes as it deems

necessary and expedient. The administering agency files its response to the Board of Directors for consideration prior to implementation of recommendations made by the evaluation team.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☒	☐	☐	☐
SHOULD BE	☐	☒	☐	☐	☐

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* REASONS FOR MAINTAINING YOUR RESPONSE DECISION *

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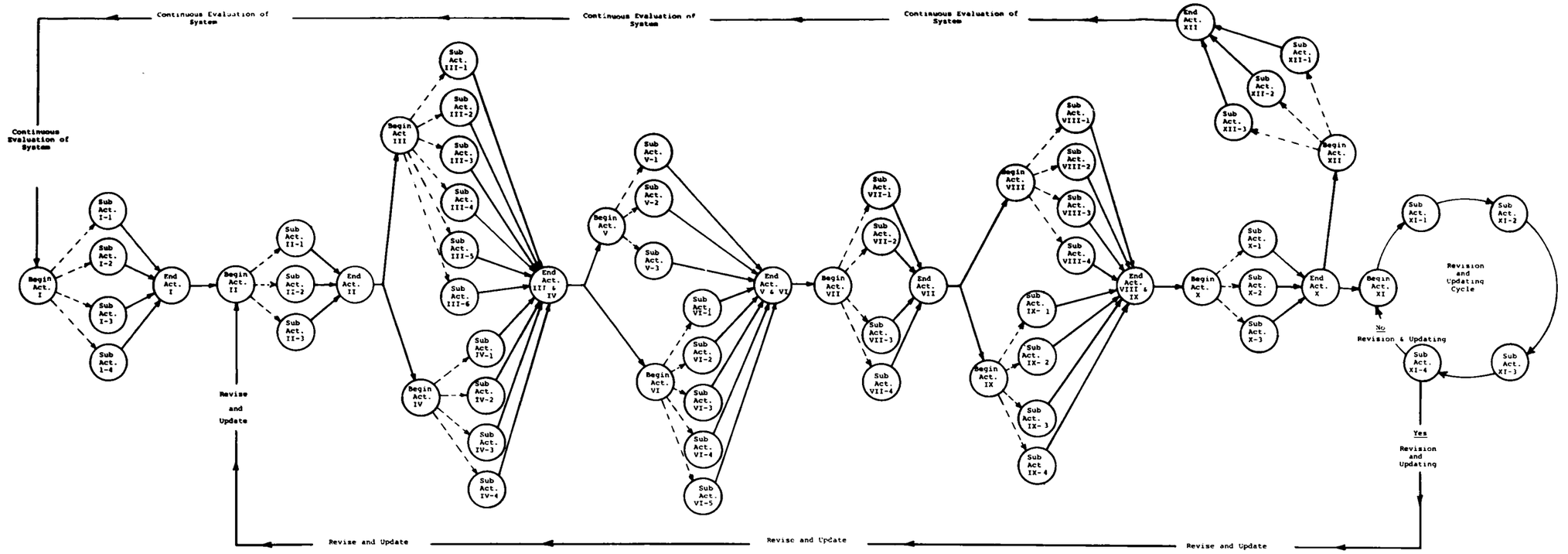
SEQUENCE RESPONSE (Complete during Step Two)

Activity XII is ☐ properly, ☐ improperly sequenced. If improperly sequenced, I recommend this Activity follow Activity ____.

ATTACHMENT A

Step II

Master Sequence Chart for the Phase I Model



I. DETERMINATION OF PRIORITIES AND ASSIGNMENT OF CATALOGS
- I-1. STATE PRIORITY DETERMINATION
- I-2. CONSORTIUM PRIORITY DETERMINATION
- I-3. RESOLUTION OF CONFLICT AND EXCHANGE OF PREVIOUS WORK RELATED TO CATALOGS TO BE DEVELOPED
- I-4. ASSIGNMENT AND/OR SELECTION OF CATALOGS

II. THE MEMORANDUM OF AGREEMENT
- II-1. MINIMUM CONTENTS OF THE MEMORANDUM OF AGREEMENT
- II-2. PROCESSING THE MEMORANDUM OF AGREEMENT
- II-3. SELECTION OF A PROJECT DIRECTOR

III. TECHNICAL PREPARATION OF V-TECS STAFF AND STATE COORDINATORS
- III-1. SYSTEM ORIENTATION
- III-2. DETERMINING DECISION CRITERIA
- III-3. INTERPRETATION OF TASK ANALYSIS DATA
- III-4. DEVELOPING SKILLS IN WRITING PERFORMANCE OBJECTIVES
- III-5. PREPARING CRITERION-REFERENCED TEST ITEMS
- III-6. MONITORING AND QUALITY CONTROL OF PERSONNEL, EDUCATION, AND TRAINING

IV. DOMAIN STUDY FOR CATALOG DEVELOPMENT
- IV-1. STATE-OF-THE-ART STUDY
- IV-2. TASK LIST DEVELOPMENT
- IV-3. DEVELOPMENT OF BACKGROUND INFORMATION
- IV-4. REPORTS OF THE DOMAIN STUDY

V. DEVELOPMENT AND IMPLEMENTATION OF THE DOMAIN SAMPLING TECHNIQUE FOR THE TASK STATEMENT SURVEY
- V-1. DESIGN OF THE SAMPLE
- V-2. ADMINISTRATION OF THE OCCUPATIONAL ANALYSIS SURVEY
- V-3. PROCESSING THE SURVEY RESULTS

VI. OCCUPATIONAL ANALYSIS SYSTEM
- VI-1. TASK TIME-SPENT INDEX
- VI-2. TASK CRITICALITY INDEX
- VI-3. TASK DIFFICULTY INDEX
- VI-4. TASK PERISHABILITY INDEX
- VI-5. PROCESSING OF DATA AND DEVELOPMENT OF REPORTS

VII. DEVELOPMENT OF CATALOGS OF PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES
- VII-1. SELECTION AND PREPARATION OF THE WRITING TEAMS
- VII-2. WRITING PERFORMANCE OBJECTIVES
- VII-3. PREPARING CRITERION-REFERENCED MEASURES
- VII-4. DEVELOPING THE CATALOG OF PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES

VIII. FIELD TESTING AND COMMONALITY STUDY
- VIII-1. FIELD TESTING DESIGN
- VIII-2. COMMONALITY REVIEW
- VIII-3. EVALUATION OF CRITERION-REFERENCED TEST ITEMS
- VIII-4. DETERMINATION OF PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES WHICH ARE APPLICABLE TO HANDICAPPED PERSONS

IX. COMPUTERIZE PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES
- IX-1. DEVELOPING COMPUTER BANK OF PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES
- IX-2. RESEARCH ASPECTS OF THE COMPUTERIZED PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES
- IX-3. MANAGEMENT OF PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES
- IX-4. DEVELOPMENT OF SPECIAL REPORTS FOR TRAINING THE HANDICAPPED LEARNER

X. IN-SERVICE EDUCATION AND DISSEMINATION PLANS
- X-1. IN-SERVICE FOR CURRICULUM DEVELOPERS
- X-2. IN-SERVICE EDUCATION FOR TEACHERS AND SUPERVISORS
- X-3. DISSEMINATION OF MATERIALS

XI. REVISION AND UPDATING OF THE CATALOGS
- XI-1. FIELD UTILIZATION STUDY
- XI-2. ANALYSIS OF DATA FROM FIELD UTILIZATION STUDY
- XI-3. CONDUCTING NEW TASK ANALYSIS
- XI-4. DECISION CRITERIA FOR REVISING AND UPDATING CATALOGS

XII. THIRD PARTY EVALUATION OF THE VOCATIONAL-TECHNICAL EDUCATION CONSORTIUM OF STATES
- XII-1. SELECTION OF THE EVALUATION TEAM
- XII-2. THE EVALUATION AND REPORT OF RESULTS
- XII-3. IMPLEMENTATION OF THE RECOMMENDATIONS OF THE EVALUATION

FIGURE 14. Master sequence chart for the Phase I a priori model, Delphi II.

APPENDIX J

SOUTHERN ASSOCIATION OF COLLEGES AND SCHOOLS

Commission on Occupational Education Institutions

Vocational-Technical Education Consortium of States

PHASE II MODEL FOR USE BY THE VOCATIONAL-TECHNICAL EDUCATION CONSORTIUM OF STATES TO MANAGE THE DEVELOPMENT, PRODUCTION, DISSEMINATION, AND IMPLEMENTATION OF CATALOGS OF PERFORMANCE OBJECTIVES AND CRITERION°REFERENCED MEASURES IN OCCUPATIONAL EDUCATION

A Research Project
Conducted by
Ben A. Hirst, Jr.
September, 1973

INSTRUCTIONS

The Delphi Probe III requires only one reading as opposed to two readings for the first two probes. The third probe requires three distinct efforts on the part of the jury of experts.

First, an observation of the scale for each Sub-Activity in the Phase I Model noting the response most frequently made by the jury of experts on the second Delphi probe (circled in black).

EXAMPLE

Sub-Activity II-1--Minimum Contents of the Memorandum of Agreement

The Memorandum of Agreement will be developed by the Consortium staff, and after a period of time, will be standardized. The Memorandum of Agreement will contain the following minimum items:

(1) date and name of catalog domain area including job titles to be surveyed
(2) designated signature blanks
(3) specific delivery dates for:
    (a) domain study and task lists
    (b) task analysis and survey results
    (c) catalog of performance objectives and criterion-referenced measures
    (d) field test period
    (e) final catalog and field test results
(4) responsibilities of a full-time technical coordinator in the state and to the Consortium
(5) Consortium staff involvement in the development of catalogs and the development of in-service training and dissemination plans

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	◉	☐	☐	☐
SHOULD BE	◉	☐	☐	☐	☐

Second, read from Attachment "B" the minority opinions of those who maintained a response on each Sub-Activity either above or below the response marked most frequently by the jury of experts on Delphi Probe II.

EXAMPLE

Activity Number II
The Memorandum of Agreement

Sub-Activity II-1--Minimum Contents of the Memorandum of Agreement

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	Based upon developmental work done to date, would have to leave rating of extremely high importance	This area has been given too high importance. Seems to be a routine matter for legal staff and project monitors--not all that important.
SHOULD BE	No comments.	Agreement will generally not make any difference; state either will or will not carry it out. This should be an amendment to the original contract and used for annual renewal. Seems to be a routine matter for legal staff and project monitors--not all that important.

Third, after consideration of these minority opinions mark an "X" in the box at the appropriate place on the scales which reflects your present perception of the importance of the activity. The "IS" and "SHOULD BE" ratings are defined as follows for this probe and the previous probes:

IS -- The row of boxes following IS should be checked at the appropriate place which represents your opinion of the importance of the sub-activity under the constraints presently known to you. (This IS response will be considered your realistic estimation of the importance.)

SHOULD BE -- The row of boxes following SHOULD BE is to be checked at the appropriate place which represents your opinion of the importance of the sub-activity without consideration of constraints known to you. (This SHOULD BE response is considered your idealistic estimation of the importance.)

If you should desire to make final comments regarding your rating of any of the Sub-Activities, a box like the one below is provided after each scale:

* * * *

GLOSSARY OF TERMS

1. Catalog - A collection of performance objectives and companion criterion-referenced test items organized by domain area and further broken down by job titles within the domain.

2. Criterion-Referenced Test Exercise - A criterion-referenced test exercise is an exercise based upon a performance objective and is designed to allow the determination of whether or not the learner has accomplished the objective. It possesses each of the characteristics specified below:

   (a) Congruence - The task specified in the item corresponds directly to the performance specified in the objective, including the situation, action, object, and limits.

   (b) Comprehensibility - The item-specified task is so stated or portrayed that the learner clearly understands what is expected of him.

   (c) Objectivity - The exercise (including component items, if any) is stated in such a way that all competent observers (evaluators) can make a clear and equivocal decision as to whether or not the learner has demonstrated an acceptable performance.

   (d) Integrity - The exercise is structured in such a way that an acceptable response to the exercise constitutes sufficient evidence, in and of itself, that the learner has accomplished the corresponding objective.

   (e) Equivalence - If two of more exercises correspond to a single objective, each exercise in the set would be a true alternate, in that a student who passes (or fails) one exercise on a given occasion would be expected to pass (or fail) any other exercise in the set.

3. Domain - A group of job titles which are closely related according to Vocational Education and Occupations, U. S. Department of Health, Education, and Welfare and U. S. Department of Labor, U. S. Government Printing Office, 1969.

4. Domain of Interest - The total content covered by a subject or occupation. Domain charts, as they become a part of a task analysis, provide the limits within which the performance objectives and criterion-referenced test exercises are developed.

5. Incumbent Worker - A person who participates in the survey of workers in business and industry, who holds a specific job at that particular time.

6. Instructional Systems - An integrated combination of resources (students, instructors, materials, equipment, and facilities), techniques, and procedures performing efficiently the functions required to achieve specified learning objectives.

7. Instructional System Development - A deliberate and orderly process for planning and developing instructional programs which insure that personnel are taught the knowledges, skills, and attitudes essential for successful job performance. This process is also known as Instructional System Engineering and Systems Approach to Training.

8. Job - The composite of duties and tasks actually performed by an individual.

9. Job Inventory - A listing of all tasks to be performed. A composite listing of job performance requirements and standards.

10. Job Performance Requirement or Standard - The tasks required of the human component of a system, including the associated standard of performance.

11. Occupational Analysis - The process of identifying duties and tasks which comprise workers' responsibilities, including the collection, collation, dna analysis of such data.

12. Performance Objective - A performance objective is a statement in precise, measurable terms of a particular behavior to be exhibited by the learner under specified conditions. It possesses each of the elements or characteristics specified below:

    (a) Situation - The situation confronting the learner is clearly specified, including the mode in which stimuli are to be presented.

    (b) Action - The action required of the learner is unambigously defined, including the mode in which responses are to be made.

    (c) Object - The object on which the learner is to operate (i.e., the object of the action) is clearly stated.

    (d) Limits - The particular limits associated with the activity expected of the learner are specified. (Limits may be placed on situation, action and/or object.)

    (e) Measurability - The specified action is an observable rather than an inferred response.

    (f) Communicability - The objective is so stated that one, and only one, interpretation of the objective is reasonably possible.

(g) Criterion - The degree of proficiency required as evidence of accomplishment by a student of the objective is indicated. (The criterion may be indicated implicitly or explicitly. If implicit, 100 percent accuracy is effectively designated. If explicity, it may be appended parenthetically to the statement of the objective.)

13. Duty - A distinct grouping of tasks which are related to each other by the nature of the work to be performed.

14. Task - A unit of work activity or operation that constitutes a logical and necessary step in the performance of a duty.

15. Task Analysis - The process of analyzing job inventory data so as to determine training requirements.

(PHASE I MODEL--DEVELOPMENT PURPOSES ONLY)

PHASE I MODEL FOR USE BY THE VOCATIONAL-TECHNICAL EDUCATION CONSORTIUM OF STATES TO MANAGE THE DEVELOPMENT, PRODUCTION, DISSEMINATION, AND IMPLEMENTATION OF DATALOGS OF PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES IN OCCUPATIONAL EDUCATION

INTRODUCTION

The following model is the result of a study of seven other models: those used by the Air Force Training Command, the State of Florida, the State of Michigan, the State of Alabama, Project CAREER within the State of Massachusetts, the Educational Testing Service, and the State of Utah. Components of the model were selected by the application of criteria taken from the Agreement Form of the Vocational-Technical Education Consortium of States (V-TECS), the minutes of the ad hoc Steering Committee which formed the Consortium, and the minutes of the Board of Directors, V-TECS. Some model components were the result of additional research conducted through an exhaustive study of the literature, a computer-assisted search of the ERIC files, a computer search of journal articles, and a manual search of the Dissertation International Index.

THE PHASE I MODEL

Activity Number I
Determination of Priorities and Assignment of Catalogs

This activity is the first step for developing catalogs of performance objectives and criterion-referenced measures. The activity has four basic sub-activities which form the rationale and consensus for catalog priority identification and assignment to the member states of V-TECS.

Sub-Activity I-1--State Priority Determination

The member states study data available to them concerning manpower needs, employment opportunities, and student interest surveys to establish a priority list within the state for catalogs of performance objectives and criterion-referenced measures. A state may consider regional and national data to determine its priorities or any other information which it deems necessary or appropriate.

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identified by the Board of Directors, a copy of such accomplished work would be provided to the state assigned the catalog area in dispute. This material will be included as an essential part of the state-of-the-art study to eliminate duplication of effort.

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Activity Number II
The Memorandum of Agreement

A Memorandum of Agreement is entered between the state selecting or being assigned a catalog to develop and the Consortium. The parties of the Memorandum of Agreement are the Chairman of the Board of Directors of V-TECS, the Executive Director of V-TECS, and the person designated by the State's Plan for Vocational Education as the State Director of Vocational Education. This activity has three sub-activities which must be completed prior to the developmental work on a catalog and they are as follows:

Sub-Activity II-1--Minimum Contents of the Memorandum of Agreement

The Memorandum of Agreement will be developed by the Consortium staff, and after a period of time, will be standardized. The Memorandum of Agreement will contain the following minimum items:

(1) date and name of catalog domain area including job titles to be surveyed
(2) designated signature blanks
(3) specific delivery dates for:
    (a) domain study and task lists
    (b) task analysis and survey results
    (c) catalog of performance objectives and criterion-referenced measures
    (d) field test period
    (e) final catalog and field test results
(4) responsibilities of a full-time technical coordinator in the state and to the Consortium
(5) Consortium staff involvement in the development of catalogs and the development of in-service training and dissemination plans

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Sub-Activity II-2--Processing the Memorandum of Agreement

The Memorandum of Agreement will take the following course for development and approval:

(1) format developed and prepared by the Consortium staff
(2) Memorandum of Agreement reviewed and signed by the Chairman of the Board of Directors and the Executive Director of V-TECS
(3) Memorandum of Agreement mailed to the states for review and signature by the State Director of Vocational-Technical Education
(4) designated copies distributed and project starts
(5) periodic PERT reports are mailed to states on request

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Sub-Activity II-3--Selection of a Project Director

Each state developing a catalog of performance objectives and criterion-referenced measures will select a person to serve as project director. The project director selects and manages writing teams which are composed of selected instructors in the domain being developed. These writing teams are trained by the project director and state technical coordinator to analyze the data resulting from the occupational analysis system, the findings of the state-of-the-art study, and other pertinent information. The project director is responsible for submitting to the state technical coordinator results of studies and analyses of data, catalogs of performance objectives and criterion-referenced measures, and other products required by the Memorandum of Agreement. The project director will meet the same qualificatons established by the Board of Directors of V-TECS for the technical coordinator in each state.

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Sub-Activity III-2--Determining Decision Criteria

The Board of Directors and the staff of V-TECS will develop the decision criteria to be used in the determination of tasks to be converted to performance objectives for cataloging. The decisions will be based upon cut-off indices of time-spent, difficulty, criticality, and task perishability. Other bases for decision criteria may be developed by the Board of Directors based upon research of the data resulting from the surveys of the incumbent workers and their immediate supervisors.

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Sub-Activity III-4--Developing Skills in Writing Performance Objectives

Workshops, seminars, and conferences will focus on the development of skills needed to write performance objectives. Consortium staff and technical coordinators will be expected to demonstrate their ability to take a given set of task statements and data, then develop written performance objectives and criterion-referenced test items.

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Sub-Activity III-5--Writing of Criterion-Referenced Test Items

Following the training of the staff and technical coordinators in the skills of writing performance objectives from task analysis data and task statements, intensive efforts will be introduced to develop companion criterion-referenced test item(s) for each performance objective. A task statement will yield one or more performance objectives and a performance objective will yield one or more criterion-referenced test items. Criterion-referenced test writing experts will serve as consultants for training Consortium staff and state technical coordinators. Personnel will either be sent to the source of technical expertise or the experts will be assembled in conference, seminar, or workshop settings.

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Sub-Activity III-6--Monitoring and Quality Control of Personnel, Education, and Training

The Consortium staff and state technical coordinators will develop individual plans of technical preparation for themselves under guidelines developed by the Board of Directors of V-TECS. These plans would serve as a guide to insure minimum competence levels of personnel of the Consortium staff and within the states. The Executive Director of the Consortium has the ultimate responsibility for monitoring individual training programs of the Consortium staff and state technical coordinators in the states. The Board of Directors will receive at least a biennial status report of the technical preparation activities designed for individual Consortium staff and technical coordinators within the states. Reports of this nature may be requested any time the Board of Directors desires to know the status of the total plan or individual progress of personnel.

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Activity Number IV
Domain Study for Catalog Development

The domain study consists of thorough and organized research of what has been developed in performance objectives and criterion-referenced measures which might be appropriate and helpful during the development of a catalog. A domain consists of a broad instructional area (such as automotive mechanics) and should include appropriate job titles (e.g., automotive tune-up mechanic, service station mechanic, serivce station attendant, front end and brake mechanic, general automotive mechanic). Activity IV consists of at least four sub-activities:

Sub-Activity IV-1--State-of-the-Art Study

This activity increases the probability that Consortium projects will find material which has already been partially or fully developed by others in a domain area. The state-of-the-art study will include the following research activities as a part of the states' development of catalogs:

(1) a search of the ERIC system for germane information
(2) a search of the journal index of ERIC for germane articles
(3) inquiries to the U. S. Office of Education, National Center for Curriculum Development in Occupational Education selected inquiries to state departments of education for germane material
(5) inquiries to industry and private training institutions
(6) review of the Dissertation Abstract International Index
(7) inquiry to local education agencies identified as working on germane projects

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Sub-Activity IV-2--Task List Development

A comprehensive list of tasks performed by the incumbent worker will be developed as a part of the domain study. The task list will be based upon research completed in the state-of-the-art study (Sub-Activity IV-1) and, in addition, will include the following:

(1) a job structure arranged from the lowest job titles to the highest job title within a domain
(2) a coding system developed by the Consortium and identified in the Dictionary of Occupational Titles will be applied to the job structure
(3) development of a task list using the following sources for obtaining task statements:
    (a) review and observation of technical procedures used by workers
    (b) identification of existing task lists or statements from technical manuals and germane literature
    (c) interviews with incumbent workers and their immediate supervisors
    (d) use of craft committees and selected committees of instructors to identify incumbent worker tasks
    (e) provision of space for a survey of incumbent workers to add task statements not included on the list

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Sub-Activity IV-3--Development of Background Information

This part of the domain study will be used in conjunction with the task list to provide data which may be cross-tabulated and studied with the companion task lists. The background information section will include as a minimum:

(1) information about the incumbent worker and/or supervisor
  (a) name and address of incumbent workers
  (b) date survey completed by incumbent worker
  (c) job title or classification
  (d) years and months of experience in career field
  (e) years and months of experience in present job title or classification
  (f) previous vocational-technical training
  (g) private or public school attendance
  (h) highest grade level completed or GED equivalent
(2) information about job satisfaction
(3) information about utilization of talents and prior training
(4) list of equipment and tools used in the jobs of the domain
(5) type of work environment of the incumbent worker
(6) size of business or industry

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Sub-Activity IV-4--Reports of the Domain Study

The following reports will be required of the domain study activity:

(1) State-of-the-Art Study--This report includes the methods used to meet the requirements of Sub-Activity IV-1, (1), (2), and (3) of the model.

(2) Background Information and Task List--This report includes a comprehensive section on background data to be completed by all incumbent workers who are surveyed. Following this section will be a comprehensive task listing which each incumbent worker will be asked to verify in his job classification. He will also be given the opportunity to add any task he is performing which is not included. The background information and task lists will be printed, in booklet form, in a standard format set by the Consortium staff and approved by the Board of Directors.

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Activity Number V
Development and Implementation of the Domain Sampling Technique for the Task Statement Survey

The purpose of this activity is to obtain a sample of incumbent workers by a domain area and collect certain information from those sampled to be used later in a task analysis. Survey booklets of task statements are developed and printed using a standard format for the background and task statement information. The sampling design would be developed by an independent agency. This activity is divided into three sub-activities dealing with the sample design, sample administration, and processing of the survey results. Alternative procedures are included as a part of Sub-Activity V-1 and Sub-Activity V-2.

Sub-Activity V-1--Design of the Sample

(a) Optimum sample design--The optimum sample design consists of administration of the task statement survey to stratified random sampling of incumbent workers holding a job classified within the domain. The base data to be used in determining the sample size will be the occupational information (coded from the Dictionary of Occupational Titles) collected during the 1970 Census of the United States. The body of the information collected will be statistically analyzed with inferences made to the population. (All workers in the United States in a given job classification within a specific domain.)

(b) Alternative sample design #1--The alternative sample design #1 collects information using the same base data as in V-1 (a) but limits the sample to the member states of the Consortium and makes no inferences beyond those states not included in the survey.

(c) Alternative sample design #2--The alternative sample design #2 collects information using the same base data as in V-1 (a) but limits the sample to the state which is developing a task survey in a particular domain. A purposive sample could be used by any state desiring to validate task lists within a state not included in the survey.

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Sub-Activity V-3--Processing the Survey Results

The results of the survey will be keypunched or optically scanned and computerized. Various analyses will be made of the data to make decisions about tasks performed by incumbent workers. These survey results will provide the basis for writing performance objectives and criterion-referenced test items. Indices of time-spent, difficulty, criticality, and perishability will provide the basis for strategic decision making. The analysis will be accomplished by using computer programs designed by the U. S. Air Force for this purpose.

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Activity Number VI
Occupational Analysis System

The backbone of the Phase I Model is the system used to develop scientific task analysis information based upon a direct survey of incumbent workers. This effort should affect the quality, realism, and scope of the catalogs of performance objectives. The basic source document for the task analysis system is the task statement survey and background information collected from the incumbent worker. Activity Number VI has five basic sub-activities which make up the system of task analysis. These sub-activities have to do with computed indices of task time-spent, task difficulty, task criticality, task perishability, and computer analysis and reporting.

Sub-Activity VI-1--Task Time-Spent Index

The incumbent workers complete the background information and check the tasks they actually perform in the task statement booklet. After checking the task statement, the incumbent worker rates the relative amount of time spent on the task along a seven-point scale. The response on the scale is converted to a time-spent index based on percentages over the total group of task statements checked. The resulting percentage figure is cumulative to 100 percent on all tasks checked. This conversion of information and calculations is accomplished by use of a computer.

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Sub-Activity VI-3--Task Difficulty Index

The same process is used to calculate an index of task difficulty which is used in the determination of the time-spent index. A seven-point scale is again employed to determine the incumbent worker's perception of task difficulty. One attitional step is included to determine the task difficulty index. The task statement survey is also administered to the immediate supervisor of the incumbent worker. The responses are then correlated, and the resulting figure becomes the difficulty index.

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Sub-Activity VI-4--Task Perishability Index

The same sampling technique and incumbent workers are used to obtain a perishability index. This index is a measure, on a seven-point scale, of the relative perishability of a task statement currently being performed by the incumbent workers participating in the survey. This index will relate to the need for retraining or refresher courses should the worker not perform, on a continuous basis, those tasks which are rated to have high indices of perishability. One implication of this type of index is to provide guidance for development of self-paced instructional packages which have as a basis the tasks which have the higher perishability indices. Retraining and development of materials could be minimized by including objectives for tasks which have high indices of perishability.

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Activity Number VII
Development of Catalogs of Performance Objectives and Criterion-Referenced Measures

The activities prior to Activity VII have emphasized primarily the training and preparation of personnel, the collection and analysis of information, and other preliminary steps necessary to write and catalog performance objectives and criterion-referenced measures. This activity is the application stage of the model. Information from incumbent workers is combined with the knowledge of selected instructors, curriculum specialists, criterion-referenced test designers, and educational researchers to transpose the resulting data into meaningful test items. Activity VII contains four sub-activities designed to accomplish this task which are as follows:

Sub-Activity VII-1--Selection and Preparation of the Writing Teams

(1) Selection of Writing Teams--The project director and technical coordinator screen possible writing team candidates and select those instructional personnel which they determine have the potential and interest to write performance objectives and criterion-referenced measures. The writing team will consist of a minimum of one instructor, one technical writer, one person having demonstrated ability and experience in developing criterion-referenced measures and one person having either local or state supervisory responsibility over the domain being developed. Each writing team should have a preferred alternate member who has responsibility in curriculum development at the local or state level. Exceptions to the writing team composition will be made upon request by the state developing the catalog. The request will be transmitted to the Board of Directors with appropriate justification for the exceptions. Decisions will rest with the Board of Directors.

(2) Preparation of Writing Teams--The state technical coordinator will have the primary responsibility of assisting the project director in the training of the writing team members. The total design of the model will be explained--the results of the state-of-the-art study, the task analysis system, and the conversion process from task statements to performance objectives. Companion criterion-referenced measures will be prepared for each performance objective incorporating performance standards which are used on the job when these standards are available. Components of the training program developed for the Consortium and state technical coordinators will be used as the basis for training and preparing the writing teams for their tasks.

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Sub-Activity VII-2--Writing Performance Objectives

All performance objectives developed by the writing teams will meet the definitions and quality criteria set forth in the Memorandum of Agreement. The components of the performance objective will contain the following requirements: situation confronting the learner, action required of the learner, object on which learner is to operate, limits of performance, measurability of the action, communicability of the objective, and degree of proficiency required of the learner.

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Sub-Activity VII-3--Preparing Criterion-Referenced Measures

Each performance objective will have one or more companion criterion-referenced test items to be used by instructional personnel. The test items will be studied to insure that a definite relationship exists between the criterion-referenced item and the standard of

performance stated in the performance objective. The definition and components of an acceptable criterion-referenced measure are spelled out in the Memorandum of Agreement and will include: congruence with the performance objective, comprehensibility (expressed at a proper reading level for the level of the training program), objectivity of the test item, integrity expressed in terms of sufficient evidence that the learner can perform the corresponding objective, and equivalence within the test items. The criterion-referenced test items will be developed by the writing teams which develop the performance objectives under the technical direction of the person on the team with test item experience, the director of the project, the technical coordinator in the state, and the technical specialist on the Consortium staff. Particular emphasis would be placed upon explicit information concerning criterion of performance on-the-job and conditions under which performance occurs. Standards would be based upon those used by business and industrial workers.

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Sub-Activity VII-4--Developing the Catalog of Performance Objectives and Criterion-Referenced Measures

The performance objectives and criterion-referenced measures will be coded by job classification within the domain being developed. This coding system will be developed by the Consortium and applied to all products of the Consortium. Catalog format and content are outlined in detail and are available through the technical coordinator in each state. All catalogs will be furnished in final draft form (camera ready) for mass production.

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Activity Number VIII
Field Testing and Commonality Study

This activity is designed to determine the instructional acceptability of the performance objectives and criterion-referenced measures. The degree of validity will be determined by analysis of teacher and instructor responses to questions during the field test portion of each project. Field test sites and conditions will be selected by the application of a criterion developed by the Board of Directors, Consortium staff, and technical coordinators. Activity VIII consists of four sub-activities as follows:

Sub-Activity VIII-1--Field Testing Design

The field test is designed to control the variables under which the catalogs will be tried by teachers and instructors. Controls are placed upon the selection of the site of field testing, supervisory and administrative support and interest, instructor or teacher interest and ability, type of facilities and equipment, and level of students (junior high schools, secondary, post-secondary, etc.). The primary emphasis is placed upon determining comprehensibility, utility, and appropriateness for instruction as perceived by the teachers and instructors. Constraints which prevent the use of a given performance objective and companion criterion-referenced measures are identified by the instructional personnel.

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Sub-Activity VIII-2--Commonality Review

During the field test, several reviews of performance objectives are made by teachers and instructors for the purpose of identifying the common performance objectives across a wide group of occupational education programs. This commonality study identifies those common performance objectives within the catalog which are applicable in several occupational domains. The common core identified is analyzed for implications for curriculum design in general shop, pre-vocational, and comprehensive career education programs.

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Sub-Activity VIII-3--Evaluation of Criterion-Referenced Test Items

A jury including an incumbent worker, a criterion-referenced test item writer, an instructor in the catalog domain area, and a supervisor of the incumbent workers represented would be used to make a final review

of the criterion-referenced test items. The primary purpose of this activity will be to reach congruence on the behavior being tested and to permit inference of competence should the learner meet the specified performance.

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Activity Number IX
Computerize Performance Objectives and Criterion-Referenced Measures

The primary purpose of this activity is to provide immediate response to the states' requests for catalogs. The computer banking of performance objectives and criterion-referenced measures eliminates the time-consuming and costly step of technical editing each time a catalog is revised and updated. Since only those objectives actually changed will be accessed from the computer, the majority remain unchanged and may be retrieved and printed in the same manner each time. Research capabilities, as well as many management possibilities, exist when the computer is used to do time-consuming calculations, compiling, and cataloging of performance objectives and criterion-referenced measures. This activity contains four sub-activities as follows:

Sub-Activity IX-1--Developing Computer Bank of Performance Objectives and Criterion-Referenced Measures

After field testing, the catalogs of performance objectives and criterion-referenced measures are processed and placed in a computer bank for rapid retrieval. The coding system adopted by the Consortium is the key to the retrieval system for the computerized information. The information is arranged so that it may be retrieved by domain area or by any coded job within a domain. A member of the Consortium may request the total catalog or any of its sub-parts for use in curriculum design and curriculum building. Information is recorded concerning the perceptions of the teachers and instructors during the field test and commonality review. These perceptions concern the comprehensiveness, utility, and appropriateness of the performance objectives and criterion-referenced measures for instruction. In addition, the perceptions concerning the commonality of performance objectives, across several programs in occupational education, are collected for analysis.

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Sub-Activity IX-2--Research Aspects of the Computerized Performance Objectives and Criterion-Referenced Measures

(1) Field Test Data--Information collected during the field test activity is analyzed by the computer. The purpose of this analysis is to identify those performance objectives and criterion-referenced measures which appear to be defective. When the defective objectives and measures have been identified, they are forwarded to the state which developed the catalog with instructions for removing the possible defects.

(2) Commonality Review--The results of the commonality review by teachers and instructors form the basis for the identification of core performance objectives. This common core provides a basis for planning curriculum for pre-vocational, general shop, related subjects, and career education programs. These common performance objectives also provide a framework for prerequisite skills, knowledge, and abilities needed by students to further their preparation for employment at a higher level.

(3) Cross-Analysis Research--Computer programs will be utilized which cross-tabulate and cross-analyze data received from teachers and instructors with data collected from the task analysis based upon surveys of incumbent workers and their immediate supervisors. The research implications of these data are unlimited when incorporated into the Revision and Updating Activities of the model.

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Sub-Activity IX-3--Management of Performance Objectives and Criterion-Referenced Measures

The application of a code number to each peformance objective, which relates it to a specific domain and, within the domain, to a specific job classification, provides an added degree of manageability. The performance objectives will be retrieved from the computer bank by job classification, by total domain, by commonality elements, or other mixes required for planning various training programs. The computer can be used to compile the catalog by printing out performance objectives in any desired structure or sub-structure within a domain. Training programs for a new or expanding industry may be designed and retrieved from the computer and can provide those performance objectives which correlate with the job structure of the new industry. The resulting performance objectives provide a realistic planning base for curriculum which must be tailor-made for the task at hand. Many other curriculum management advantages can be developed upon this computer bank of performance objectives. The curriculum design implications are limited only by financial resources and human ingenuity.

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Sub-Activity IX-4--Development of Special Reports for Training the Handicapped Learner

The information collected from the work of the special committee for the handicapped (Sub-Activity VIII-4) would be computerized and used as a research base for developing planning and organizing training program and activities for the handicapped learner. The performances specified in the objectives and criterion-referenced measures could be modified to permit handicapped workers to demonstrate their ability in terms of particular job titles. Other valuable research could be accomplished by using the data concerning the abilities of the handicapped and comparing it with background information from the incumbent workers and their immediate supervisors.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	◉	☐	☐	☐
SHOULD BE	☐	◉	☐	☐	☐

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Sub-Activity X-1--In-Service for Curriculum Developers

Specific programs will be planned for preparing curriculum developers concerning the use of catalogs for organizing learning activities. These programs are to be planned jointly with Consortium staff and include a comprehensive explanation of the system used to develop catalogs, the skills required for retrieving appropriate performance objectives and criterion-referenced measures, and the management strategies necessary to implement a performance-based curriculum effort in the classroom and laboratory. Strategies will also be included to provide direction in the organization and preparation of learning activities.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	◉	☐	☐	☐
SHOULD BE	◉	☐	☐	☐	☐

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	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	◉	☐	☐	☐
SHOULD BE	◉	☐	☐	☐	☐

FINAL COMMENTS

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Sub-Activity X-3--Dissemination of Materials

A dissemination outline to be developed by the Board of Directors of V-TECS should serve as a guide for the states. The specific methods of dissemination are left entirely to the participating states. The Consortium staff will assist the states as needed and will encourage the dissemination plan to be integrated with the in-service education plan when at all possible. This integration should insure proper preparation of the users and managers of the learning process and, at the same time, provide a logical point of dissemination.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	◉	☐	☐	☐
SHOULD BE	☐	◉	☐	☐	☐

FINAL COMMENTS

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Activity Number XI
Revision and Updating of the Catalogs

The rapid rate of change in a technical society mandates a better way of keeping vocational-technical instructional materials up-to-date; but, more importantly, it mandates keeping them relevant to the needs of a modern job structure. This activity is designed to maximize input from instructional personnel, craft advisory committees, and the incumbent worker so that catalogs may be revised on a scientific and as-needed basis. This activity contains four sub-activities which form a cycle for revising and updating the catalogs. The cycle will take approximately three years to complete with a decision to revise and update or not to revise and update at the eighteen-month point in the cycle.

Sub-Activity XI-1--Field Utilization Study

Continuous field study is made regarding the catalogs of performance objectives and criterion-referenced measures. The purposes of the field study are to: (1) detect the defective performance objectives and criterion-referenced measures, (2) identify additional performance objectives which may need to be added to the catalog when it is revised, and (3) obtain a wider participation in the developmental activities, particularly in the area of curriculum materials.

The field utilization study has two major components for achieving the purposes:

(1) Teacher and Curriculum Developer Inputs--During the first year of use, the teachers and curriculum developers will be asked to react to questions concerning readability, comprehensibility, specificity, and appropriateness of performance objectives and criterion-referenced measures. This information is added to the body of data already existing on the performance objective as a result of the commonality study and the field test results.

(2) Craft Advisory Committee Inputs--Early in the second year, the craft advisory committees for the programs using the material review each performance objective and respond to questions concerning (a) the utility of the performance objective, (b) the appropriateness for present job requirements, (c) the extent to which the performance objective is accomplished by entry level employees, relatively experienced employees, and experienced employees, and (d) the relative criticality of the performance objective.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	◉	☐	☐	☐
SHOULD BE	◉	☐	☐	☐	☐

FINAL COMMENTS

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Sub-Activity XI-2--Analysis of Data from Field Utilization Study

The information collected from the field utilization study is computerized, and reports are developed to determine the results. Statistical analysis is applied to the data to accomplish the purposes of the field utilization study. Data are compared with the results of Sub-Activity XI-3, survey of incumbent workers, for the purpose of deciding whether the catalog should be revised and updated or if it is still sufficiently valid for continued use.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	◉	☐	☐	☐
SHOULD BE	☐	◉	☐	☐	☐

FINAL COMMENTS

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Sub-Activity XI-3--Conducting New Task Analysis

The same procedure used in Activity VI, task analysis system, is used at the twenty-fourth month point in the revision and updating cycle. The same task statements are used with the exception that those added by incumbent workers on the initial survey are included for this survey application.

Additional information requested of the incumbent worker is that he add any tasks he is now doing which do not appear on the list and place an asterisk by those task statements which he has begun to perform for the first time during the last twelve months.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	◉	☐	☐	☐
SHOULD BE	☐	◉	☐	☐	☐

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Activity Number XII
Third Party Evaluation of the Vocational-Technical Education Consortium of States

Evaluation of the Consortium on a biennial basis is considered desirable by the Board of Directors of V-TECS. A third party evaluator will be selected on a low bid basis from a group of competent and qualified evaluators. This type of assessment has important advantages and will serve as a basis for self-renewal. This activity contains three sub-activities which are as follows:

Sub-Activity XII-1--Selection of the Evaluation Team

The Board of Directors of V-TECS will select a qualified low bidder as a third party evaluator from states or organizations outside the membership to evaluate and make recommendations concerning the total organization and its procedures. This evaluation shall occur within the first two years of the operation and every two years thereafter. The Board of Directors selects and employs the evaluators and sets guidelines for their study. These guidelines will be used as a basis for developing a well-defined and congruent request for proposals.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	◉	☐	☐	☐
SHOULD BE	☐	◉	☐	☐	☐

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	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	☐	◉	☐	☐
SHOULD BE	☐	◉	☐	☐	☐

FINAL COMMENTS

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Sub-Activity XII-3--Implementation of the Recommendations of the Evaluation

The Board of Directors of V-TECS reviews the evaluation results and directs the implementation of the recommended changes as it deems necessary and expedient. The administering agency files its response to the Board of Directors for consideration prior to implementation of recommendations made by the evaluation team.

	of extremely high importance	of high importance	of medium importance	of low importance	of no importance
IS	☐	◉	☐	☐	☐
SHOULD BE	☐	◉	☐	☐	☐

FINAL COMMENTS

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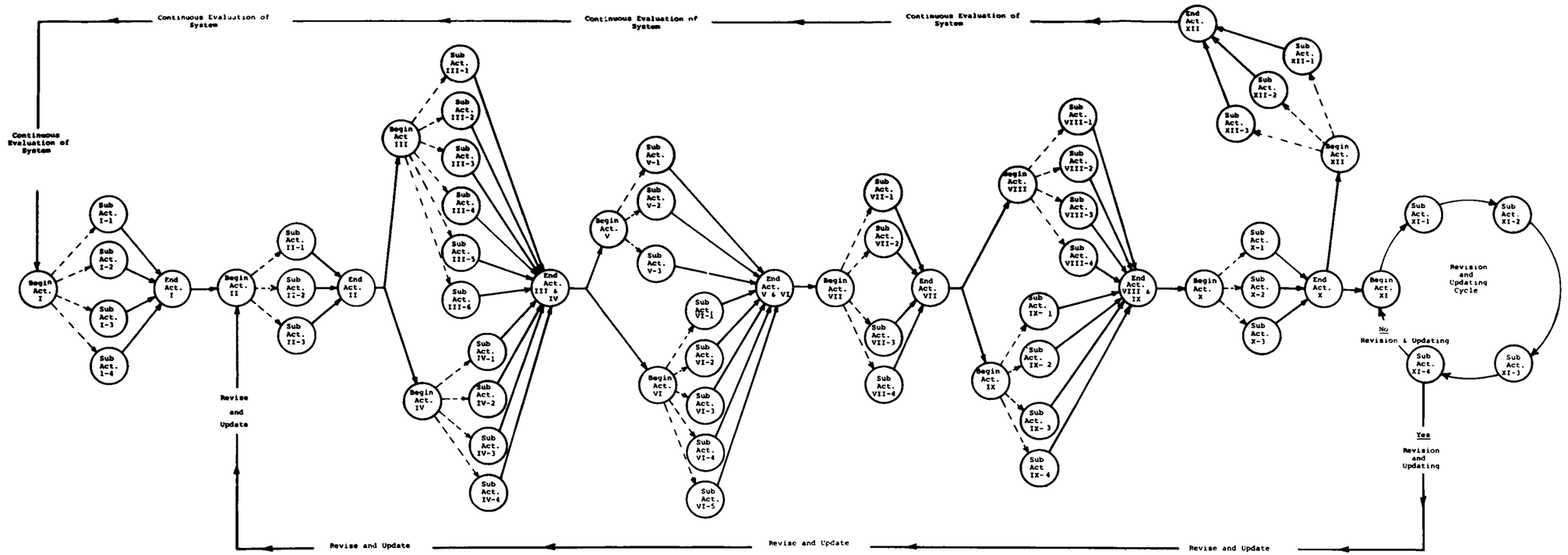
ATTACHMENT A

Master Sequence Chart for the Phase II Model



I. DETERMINATION OF PRIORITIES AND ASSIGNMENT OF CATALOGS

- I-1. STATE PRIORITY DETERMINATION
- I-2. CONSORTIUM PRIORITY DETERMINATION
- I-3. RESOLUTION OF CONFLICT AND EXCHANGE OF PREVIOUS WORK RELATED TO CATALOGS TO BE DEVELOPED
- I-4. ASSIGNMENT AND/OR SELECTION OF CATALOGS

II. THE MEMORANDUM OF AGREEMENT

- II-1. MINIMUM CONTENTS OF THE MEMORANDUM OF AGREEMENT
- II-2. PROCESSING THE MEMORANDUM OF AGREEMENT
- II-3. SELECTION OF A PROJECT DIRECTOR

III. TECHNICAL PREPARATION OF V-TECS STAFF AND STATE COORDINATORS

- III-1. SYSTEM ORIENTATION
- III-2. DETERMINING DECISION CRITERIA
- III-3. INTERPRETATION OF TASK ANALYSIS DATA
- III-4. DEVELOPING SKILLS IN WRITING PERFORMANCE OBJECTIVES
- III-5. PREPARING CRITERION-REFERENCED TEST ITEMS
- III-6. MONITORING AND QUALITY CONTROL OF PERSONNEL, EDUCATION, AND TRAINING

IV. DOMAIN STUDY FOR CATALOG DEVELOPMENT

- IV-1. STATE-OF-THE-ART STUDY
- IV-2. TASK LIST DEVELOPMENT
- IV-3. DEVELOPMENT OF BACKGROUND INFORMATION
- IV-4. REPORTS OF THE DOMAIN STUDY

V. DEVELOPMENT AND IMPLEMENTATION OF THE DOMAIN SAMPLING TECHNIQUE FOR THE TASK STATEMENT SURVEY

- V-1. DESIGN OF THE SAMPLE
- V-2. ADMINISTRATION OF THE OCCUPATIONAL ANALYSIS SURVEY
- V-3. PROCESSING THE SURVEY RESULTS

VI. OCCUPATIONAL ANALYSIS SYSTEM

- VI-1. TASK TIME-SPENT INDEX
- VI-2. TASK CRITICALITY INDEX
- VI-3. TASK DIFFICULTY INDEX
- VI-4. TASK PERISHABILITY INDEX
- VI-5. PROCESSING OF DATA AND DEVELOPMENT OF REPORTS

VII. DEVELOPMENT OF CATALOGS OF PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES

- VII-1. SELECTION AND PREPARATION OF THE WRITING TEAMS
- VII-2. WRITING PERFORMANCE OBJECTIVES
- VII-3. PREPARING CRITERION-REFERENCED MEASURES
- VII-4. DEVELOPING THE CATALOG OF PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES

VIII. FIELD TESTING AND COMMONALITY STUDY

- VIII-1. FIELD TESTING DESIGN
- VIII-2. COMMONALITY REVIEW
- VIII-3. EVALUATION OF CRITERION-REFERENCED TEST ITEMS
- VIII-4. DETERMINATION OF PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES WHICH ARE APPLICABLE TO HANDICAPPED PERSONS

IX. COMPUTERIZE PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES

- IX-1. DEVELOPING COMPUTER BANK OF PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES
- IX-2. RESEARCH ASPECTS OF THE COMPUTERIZED PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES
- IX-3. MANAGEMENT OF PERFORMANCE OBJECTIVES AND CRITERION-REFERENCED MEASURES
- IX-4. DEVELOPMENT OF SPECIAL REPORTS FOR TRAINING THE HANDICAPPED LEARNER

X. IN-SERVICE EDUCATION AND DISSEMINATION PLANS

- X-1. IN-SERVICE FOR CURRICULUM DEVELOPERS
- X-2. IN-SERVICE EDUCATION FOR TEACHERS AND SUPERVISORS
- X-3. DISSEMINATION OF MATERIALS

XI. REVISION AND UPDATING OF THE CATALOGS

- XI-1. FIELD UTILIZATION STUDY
- XI-2. ANALYSIS OF DATA FROM FIELD UTILIZATION STUDY
- XI-3. CONDUCTING NEW TASK ANALYSIS
- XI-4. DECISION CRITERIA FOR REVISING AND UPDATING CATALOGS

XII. THIRD PARTY EVALUATION OF THE VOCATIONAL-TECHNICAL EDUCATION CONSORTIUM OF STATES

- XII-1. SELECTION OF THE EVALUATION TEAM
- XII-2. THE EVALUATION AND REPORT OF RESULTS
- XII-3. IMPLEMENTATION OF THE RECOMMENDATIONS OF THE EVALUATION

FIGURE 15. Master sequence chart for the Phase II activity model, Delphi III.

ATTACHMENT B

Comments of the Jury of Experts from Delphi Probe II

COMMENTS OF THE JURY OF EXPERTS
FROM DELPHI PROBE II

Points of View Above and Below the Most Frequent Responses

Introduction

Following is a list of comments which were made by members of the jury of experts who maintained ratings on Delphi Probe II which were either above or below the point checked by most respondents. Many comments were made but only those which represent reasons different from those responses checked most frequently on Delphi Probe II were used. The comments in the left column represent those made by members of the jury of experts who maintained a point on the scale higher than that checked by most respondents. The comments in the right column represent those made by members of the jury of experts who maintained a point on the scale lower than that checked by most respondents. Please consider both the positive and negative comments under "IS" and "SHOULD BE" prior to marking your decision on the rating during this Delphi Probe III.

Activity Number I
Determination of Priorities and Assignment of Catalogs

Sub-Activity I-1--State Priority Determination

IS

Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
No comments.	Doubt that data are available to justify an indepth study in the states.
	It is debatable whether state staff can establish priorities based on available data.
	State presently studies available data to establish priorities.

Sub-Activity I-1 (continued)

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS		The method of determination is not of extremely high importance as long as the method is logical and will get the job done.
SHOULD BE	No comments.	It is debatable whether state staff can establish priorities based on available data. Priority determination usually idealistic rather than based upon valid study. State-of-the-Art not advanced enough to place in extremely high importance; processes used now are generally sloppy.

Sub-Activity I-2--Consortium Priority Determination

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	Board of Directors would be best qualified to select catalogs to be developed and make assignments. Discussion, develop priorities, negotiations caused the maintenance of high ratings. If priorities are not selected properly and jointly the entire process will break down.	Doubt that this non-duplication effort can be properly resolved in a "Discussion Framework." Important, but would take place rather automatically. The selection of priority areas does not seem related to manpower needs and projects.

Sub-Activity I-2 (continued)

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
	If smooth transition can be made from Sub-Activity I-2 to I-3 without "hurt" feelings should be extremely important.	Important, but would take place rather automatically.
	This activity is critical to the success or failure of the program. It must be of extremely high importance.	The selection of priority areas does not seem related to manpower needs and projects.
SHOULD BE	Discussion, develop priorities, negotiations caused the maintenance of high ratings.	
	If priorities are not selected properly and jointly the entire process will break down.	
	More emphasis should be placed by V-TECS Board of Directors on regional and national data in order to make better choices for catalog development.	

Sub-Activity I-3--Resolution of Conflict and Exchange of Previous Work Related to Catalogs to Be Developed

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	No comments.	No comments.
SHOULD BE	No comments.	No comments.

Sub-Activity I-4--Assignment and/or Selection of Catalogs

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	No comments.	No comments.
SHOULD BE	No comments.	It makes little difference who makes the decision since individual states have option to accept and/or reject. Each state should have ability to do any catalog assigned by the Consortium really shouldn't be critical.

Activity Number II
The Memorandum of Agreement

Sub-Activity II-1--Minimum Contents of the Memorandum of Agreement

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	Based upon developmental work done to date, would have to leave rating of extremely high importance.	This area has been given too high importance. Seems to be a routine matter for legal staff and project monitors--not all that important.
SHOULD BE	No comments.	Agreement will generally not make any difference; state either will or will not carry it out. This should be an amendment to the original contract and used for annual renewal. Seems to be a routine matter for legal stuff and project monitors--not all that important.

Sub-Activity II-2--Processing the Memorandum of Agreement

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	Would maintain extremely high importance based on awareness of V-TECS activities. A fairly simple task and one that state agencies can do well. Memo of Agreement is critical--deserves of extremely high importance.	States are aware of their responsibility when they join the Consortium--this is only a formality. In a rank ordering, this task would be low.
SHOULD BE	Would maintain extremely high importance based on awareness of V-TECS activities. Memo of Agreement is critical--deserves of extremely high importance. Communications in this type project is important and is a two-way street--PERT charts would be very helpful here.	This activity is not greatly significant--purely administrative. States are aware of their responsibility when they join the Consortium--this is only a formality. In a rank ordering, this task would be low.

Sub-Activity II-3--Selection of a Project Director

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	Cannot emphasize too much the importance selecting a proper project director. Selection of project director with competence is very important.	State agencies may select person not qualified for the job or someone who happens to be available or whose present job is abolished. Most difficult to train writing teams--instructors should evaluate not write objectives.

Sub-Activity II-3 (continued)

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	This is the key person in the system--the best qualified people must be selected.	In some cases people are already selected or will be utilized rather than most qualified. Because of constraint of finding qualified people. The selection of a project director and support manpower should be higher priority to insure project success.
SHOULD BE	No comments.	Effectiveness of project director will be determined by V-TECS staff guidance; whomever is selected must be "re-molded." Most difficult to train writing teams--instructors should evaluate not write objectives.

Activity Number III
Technical Preparation of V-TECS Staff and State Coordinators

Sub-Activity III-1--System Orientation

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	Orientation to program and system by V-TECS staff is of extremely high importance to broad acceptance. This is a primary issue; system will not go without proper orientation.	Extremely important, however, in actual practice the general system orientation will probably be short cut and the necessary skills not developed to a high enough level.

Sub-Activity III-1 (continued)

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	Extremely important that staff and technical coordinator have an exact working performance ability--catalogs only as good as staff. Few people are familiar with this system and these concepts; orientation "IS" therefore considered extremely important. The preparation of technical coordinators and Consortium staff is of greatest importance. Absolutely of extremely high importance. If you miss out here, forget it.	An orientation never produces in-depth training. Its value can only be measured as personnel apply skills developed during later activities.
SHOULD BE	No comments.	An orientation never produces in-depth training. Its value can only be measured as personnel apply skills developed during later activities. Under ideal conditions many people in education would already be familiar with the concepts, process, and system.

Sub-Activity III-2--Determining Decision Criteria

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	No comments.	No comments.

Sub-Activity III-2 (continued)

SHOULD BE	No comments.	No comments.

Sub-Activity III-3--Interpretation of Task Analysis Data

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	No comments.	Experience with the ability of State Department Personnel to be prepared for this type effort has not been good. Will only work if Consortium has control and can exercise an effect on personnel who do not perform. Should be done--but most difficult. The training will suffer from certain probable constraints. To date no extensive plans exist in this area of activity. Willing to increase rating but not to extremely high importance. Not clearly indicated by sampling activities being conducted by the Consortium.
SHOULD BE	No comments.	Should be done--but most difficult. Willing to increase rating but not to extremely high importance.

Sub-Activity III-4--Developing Skills in Writing Performance Objectives

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	Based on developmental efforts, rating must be of extremely high importance. This is an extremely critical issue. This is a must for success of the program. This activity should be of highest importance to V-TECS Staff. Extremely important--better be right on the money.	Selection is more important than organization; only those with talent in writing should be selected. Very difficult to do.
SHOULD BE	No comments.	Selection is more important than organization; only those with talent in writing should be selected. A matter of degree--high yes--extremely high maybe not. This is important and can be taught rapid but should not be rated as extremely important.

Sub-Activity III-5--Writing of Criterion-Referenced Test Items

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	Based on experience and knowledge of work done by the U. S. Air Force, rating must be maintained of extremely high importance.	Selection of writers should be based on ability to write well.

Sub-Activity III-5 (continued

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	This is one of the critical activities. The measures are just as important as the performance objectives.	The difficulty will be finding test writing experts.
SHOULD BE	No comments.	Selection of writers should be based on ability to write well. A matter of degree--high yes--extremely high maybe not. Criterion referenced measures are highly important but their critical value to this project is not of highest importance.

Sub-Activity III-6--Monitoring and Quality Control of Personnel, Education, and Training

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
	Constant monitoring and quality control of personnel, education, and training are essential to the overall success of the effort.	No comments.
IS	This activity is critical to overall quality and usefulness of the catalogs. Must be PERT charted, provided, and continually assessed.	

Sub-Activity III-6 (continued)

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
	Constant monitoring and quality control of personnel, education, and training are essential to the overall success of the effort.	No comments.
	If you don't monitor carefully you lose control over project and output.	
	Program is no stronger than personnel; we must insist on standards.	
SHOULD BE	Personnel should work to the best of their ability--keeping efforts under control and moving is vital.	
	Should be extremely important during initial projects.	
	Degree of success of project will be closely related to how well personnel are trained.	
	This activity is critical to overall quality and usefulness of the catalogs.	
	Of extremely high importance because competence of personnel is a must.	
	Must be PERT charted, provided, and continually assessed.	

Activity Number IV
Domain Study for Catalog Development

Sub-Activity IV-1--State-of-the-Art Study

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	Due to availability of computer searches and accessibility to other information sub-activity is of extremely high importance. This is extremely important if project is to maximize resources. A high priority effort of significance if benefits or prior work are utilized.	Highly suspicious of objectives developed by other concerns. Too often accomplished without a thorough task analysis or data base. It is doubtful the literature will contain or have as appendices detailed data upon which the performance objectives were based. Very few documents are currently available which lessens the importance of this activity at this time.
SHOULD BE	No comments.	Highly suspicious of objectives developed by other concerns. Too often accomplished without a thorough task analysis or data base. Important, but <u>not</u> as important as a catalog of high quality. No State-of-the-Art Study can be complete in its coverage--something critical to a project can be left out or missed. Results of a State-of-the-Art Study will suggest that materials located are of poor quality.

Sub-Activity IV-2--Task List Development

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	A valid task analysis can be no better than the developed task lists.	Very difficult.
SHOULD BE	No comments.	It will not matter much if this is not known. How to do this is of more concern than what is involved. With proper management this should evolve alright.

Sub-Activity IV-3--Development of Background Information

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
	How to do this is a concern but it should evolve alright with proper management.	Some portions of background data are important--others increase paper work and are time consumers.
	Background information reveals a person's attitude toward his development of skills and his advancement.	
IS	Realistically of higher importance because a great deal can be gained by relating what a person does with background data.	
	This is absolutely necessary to validate performance measures; it <u>can</u> be done with project constraints.	
	Not enough emphasis for very important information	

Sub-Activity IV-3 (continued)

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
SHOULD BE	No comments.	Too many things to cross tabulate. Should define what you want then cross tabulate--very time consuming even with a computer.
		Collection of too much information tends to lead to "playing games" with this type information which may not contribute to a practical or statistical solution of real problems.
		How to do this is a concern but it should evolve alright with proper management.
		Such detailed information is not necessary if sampling is properly handled, and may be too costly and time consuming.
		All items included are not important in completing a task analysis.
		Not as critical as some other tasks.
		Some portions of background data are important--others increase paper work and are time consumers.
		Quality of data derived may be more a function of the "personal" qualities of the incumbent worker than his technical experience.

Sub-Activity IV-4--Reports of the Domain Study

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	This activity deserves highest priority if results are to be valid.	This will be very difficult to do. "Nice to have" information but not of highest importance.
SHOULD BE	This activity deserves highest priority if results are to be valid. There should be a space in the background section for listing unique situations.	"Nice to have" information but not of highest importance.

Activity Number V
Development and Implementation of the Domain Sampling Technique for the Task Statement Survey

Sub-Activity V-1--Design of the Sample

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	Sample design of extreme importance in order to enhance the probability of a statistically-sound sample of incumbent workers.	Sample design should be determined very precisely to avoid confusion. Important--if computer time is available. Not as important as other items checked as highly important. Relatively speaking, other activities more critical importance.

Sub-Activity V-1 (continued)

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
	Sample design of extreme importance in order to enhance the probability of a statistically-sound sample of incumbent workers.	Not as important as other items checked as highly important.
SHOULD BE	Sample design should be determined very precisely to avoid confusion.	
	The activity is extremely critical to success of the program.	

Sub-Activity V-2--Administration of the Occupational Analysis Survey

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	No comments.	We should make up our minds about this and define precisely.
		Almost impossible to get the worker to respond.
	We should make up our minds about this and define precisely.	Almost impossible to get the worker to respond.
SHOULD BE	This activity is very critical to the validity of the catalogs.	

Sub-Activity V-3--Processing the Survey Results

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	With computer programs available and expertise how can this be rated lower than of extremely high importance? A key activity in the total process. The data is worthless without adequate analysis. Essential to the development of valid instruments; it is also feasible.	This is a routine activity.
SHOULD BE	Absolutely important if the project is to do what it should do. With computer programs available and expertise how can this be rated lower than of extremely high importance? A key activity in the total process. Critical to the success of the projects. How else can such massive quantities of data be handled. A critical item--basis for performance objectives and criterion-referenced tests. The data is worthless without adequate analysis. Essential to the development of valid instruments; it is also feasible.	This is a routine activity.

Activity Number VI
Occupational Analysis System

Sub-Activity VI-1--Task Time-Spent Index

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	Time spent index should be extremely valuable in determining objectives to be developed. This information is the very basis for the entire process--extremely important. This index may represent one of the most significant pieces of data gathered. Crucial. This component of the occupational analysis system is essential to establishment of a valid catalog.	Importance depends upon how data obtained would be used. This is routine activity.
SHOULD BE	Time spent index should be extremely valuable in determining objectives to be developed. This information is the very basis for the entire process--extremely important. This index may represent one of the most significant pieces of data gathered. This component of the occupational analysis system is essential to establishment of a valid catalog.	Importance depends upon how data obtained would be used. This is routine activity. Frequence of performance is not being collected. Most responses will be clustered in the 3, 4, and 5 point range. There is a difference between what a worker states he does and what he actually does.

Sub-Activity VI-2--Task Criticality Index

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	Criticality must certainly be an important factor in selecting tasks for objective development. Criticality of task and performance would be very useful in classroom and lab or shop. This component of the occupational analysis system is essential and has been established in the project plans.	This is routine activity. Do not have experience to work with criticality at this time. Much error is associated with this type of measurement--should not serve as primary source of information for decision making. Not sure job incumbent is the person to do this.
SHOULD BE	No comments.	This is routine activity. The worker may not have the best perception regarding the elements of task criticality. Do not have experience to work with criticality at this time. Much error is associated with this type of measurement--should not serve as primary source of information for decision making. Not sure job incumbent is the person to do this. Task criticality is too variable to rate the highest level of importance--even ideally.

Sub-Activity VI-3--Task Difficulty Index

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	Task difficulty must be considered in order to establish sequence and continuity in objectives. This component of the occupational analysis system is essential and has been thus established in the project plans.	Doubt that this can be accomplished to a high degree. An appraisal of task difficulty is important but a well written objective, accepted by the user of the product would mean the same thing. This is routine activity. Number of tasks performed could determine difficulty level. Don't know enough about task difficulty to determine how important it really is. Much error associated with this type measurement--should not serve as primary source of information for decision making. If task is critical and if considerable time is spent then task should be learned regardless of its difficulty. Difficulty index is not that critical to the "Bag of Competencies" possessed by an incumbent. It is more critical to the instructional process.
SHOULD BE	No comments.	Doubt that this can be accomplished to a high degree.

Sub-Activity VI-3 (continued)

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
SHOULD BE		An appraisal of task difficulty is important but a well written objective, accepted by the user of the product would mean the same thing. This is routine activity. Number of tasks performed could determine difficulty level. Don't know enough about task difficulty to determine how important it really is. Much error associated with this type measurement--should not serve as primary source of information for decision making. If task is critical and if considerable time is spent then task should be learned regardless of its difficulty. Difficulty index is not that critical to the "Bag of Competencies" possessed by an incumbent. It is more critical to the instructional process.

Sub-Activity VI-4--Task Perishability Index

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	Task perishability has implications not only for preparatory programs, but for supplementary programs as well. Task frequency is equally important as difficulty, time spent, etc., in training system design. Perishability is certainly not any more important than time-spent, difficulty, or criticality. Each index should be investigated as to its role in the training program. This component of the occupational analysis system is essential and has been thus established in the project plans.	No real value for this activity. It is of high importance; but don't bite off more than you can chew.
SHOULD BE	No comments.	We may be looking for a precision which does not exist. No real value for this activity. It is of high importance; but don't bite off more than you can chew. May be of high importance but does not constitute a need for extreme rating.

Activity Number VII
Development of Catalogs of Performance Objectives and Criterion-Referenced Measures

Sub-Activity VII-1--Selection and Preparation of the Writing Teams

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	No comments.	Using instructors rather than trained writers will be difficult. In some states, this activity is viewed as of no importance by vocational leaders. Writing team isn't necessary or logical; curriculum consultant would be more efficient.
SHOULD BE	No comments.	Alternatives to writing teams are desirable. What is outlined for preparation programs leaves something to be desired. Writing team isn't necessary or logical; curriculum consultant would be more efficient.

Sub-Activity VII-2--Writing Performance Objectives

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	Definitions and quality criteria in Memorandum of Agreement have been tested and refined in enough projects to maintain extremely high rating.	Too many components.

Sub-Activity VII-2 (continued)

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	This is the heart of the project and it is extremely important that all performance objectives meet the criteria. All elements are needed to make it complete. Uniformity is very important.	
SHOULD BE	No comments.	No comments.

Sub-Activity VII-3--Preparing Criterion-Referenced Measures

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	No comments.	Based on experience, should be of high importance. This activity will require real effort. If of medium importance because of lack of people qualified to prepare criterion-referenced items or who wish to.
SHOULD BE	No comments.	No comments.

Sub-Activity VII-4--Developing the Catalog of Performance Objectives and Criterion-Referenced Measures

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	Consistency in process and format is important.	Is critical and must be standardized.
	Critical to success.	
SHOULD BE	Should be of extremely high importance--why downgrade the product.	
	Is critical and must be standardized.	
	Coding can help later in commonality review.	
	Consistency in process and format is important.	

Activity Number VIII
Field Testing and Commonality Study

Sub-Activity VIII-1--Field Testing Design

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
	Procedures have been established to assure adequate field testing.	Limiting factors will be instructional materials, equipment, and instructors.
IS		Prefer to have observation of workers' activities as chief determiner of comprehensibility and appropriateness because of possible teacher bias; teachers can determine utility and identify constraints.

Sub-Activity VIII-1 (continued)

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS		Real field test is when curriculum is developed based on catalog. Utility of catalogs will differ if data will be used to validate existing programs or develop new programs.
SHOULD BE	No comments.	Limiting factors will be instructional materials, equipment, and instructors. Prefer to have observation of workers' activities as chief determiner of comprehensibility and appropriateness because of possible teacher bias; teachers can determine utility and identify constraints. Other criteria for selection should be considered in addition to those indicated. Real field test is when curriculum is developed based on catalog.

Sub-Activity VIII-2--Commonality Review

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	No comments.	Should be able to cross reference common tasks to get common objectives in a less time consuming way.

Sub-Activity VIII-2 (continued)

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
	No comments.	This is not as high in importance as some other sub-activities.
SHOULD BE		Not sure all this can be done initially.
		Should be able to cross reference common tasks to get common objectives in a less time consuming way.

Sub-Activity VIII-3--Evaluation of Criterion-Referenced Test Items

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	No comments.	No comments.
SHOULD BE	No comments.	No comments.

Sub-Activity VIII-4--Determination of Performance Objectives and Criterion-Referenced Measures Which Are Applicable to Handicapped Persons

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	No comments.	No comments.
SHOULD BE	No comments.	No comments.

Activity Number IX
Computerize Performance Objectives and Criterion-Referenced Measures

Sub-Activity IX-1--Developing Computer Bank of Performance Objectives and Criterion-Referenced Measures

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	No comments.	Money is the constraint here. The effort in computerizing performance objectives is not worth the money.
SHOULD BE	No comments	Developing computer bank is routine. Not sure that computerized catalogs will be used by teachers. Retrieval can be fast and efficient at lower costs.

Sub-Activity IX-2--Research Aspects of the Computerized Performance Objectives and Criterion-Referenced Measures

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	No comments.	Elements of sub-activity don't really fit as far as implications go.
SHOULD Be	Unlikely that high degree of consensus will be obtained as to the skills/knowledges which most effectively mediate the performance behaviors.	Elements of sub-activity don't really fit as far as implications go.

Sub-Activity IX-3--Management of Performance Objectives and Criterion-Referenced Measures

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	This should be ultimate goal--we must reach this stage. This activity is viewed as extremely high importance and in some cases has already been started.	Fail to see implications now. Of critical significance but a clerical detail.
SHOULD BE	No comments.	Fail to see implications now. Of critical significance but a clerical detail. Computer programming isn't the answer to everything.

Sub-Activity IX-4--Development of Special Reports for Training the Handicapped Learner

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	No comments.	No comments.
SHOULD BE	No comments.	No comments

Activity Number X
In-Service Education and Dissemination Plans

Sub-Activity X-1--In-Service for Curriculum Developers

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	No comments.	No comments.
SHOULD BE	No comments.	No comments.

Sub-Activity X-2--In-Service Education for Teachers and Supervisors

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	Since implementation is the key to success, all emphasis should be directed through top management to supervisors. Very important to train people to use catalogs. They are anxious for products that are useable. Overlaps X-1.	In-service programs are of little value unless a great deal of energy is devoted but there is some doubt that it will be done. That is important but shouldn't be regulated by V-TECS. Haven't seen any extensive plans for this to date. Cost and expertise is a constraint.
SHOULD BE	No comments.	Important, but role of Board should provide leadership and assistance. This is important but shouldn't be regulated by V-TECS.

Sub-Activity X-3--Dissemination of Materials

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	Entire project can be sold or lost during dissemination phase.	Consortium should maintain some control over dissemination for good results.
SHOULD BE	Critical to success. Dissemination should be of highest importance to achieve intended outcomes. It is urgent to get the product into the field. Extremely important in terms of consequence. Must ensure that all of this effort is properly utilized. Entire project can be sold or lost during dissemination phase. Must be given highest priority for best results.	No comments.

Activity Number XI
Revision and Updating of the Catalogs

Sub-Activity XI-1--Field Utilization Study

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	Must review objectives to assure real time relevance of programs.	Revision and updating should be achieved by periodically repeating the entire process.
SHOULD BE	No comments.	Important. Revision and updating should be achieved by periodically repeating the entire process.

Sub-Activity XI-2--Analysis of Data from Field Utilization Study

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	Constructive improvements based on analysis should be put into operation as soon as possible. This is another critical activity. This activity is critical to success of effort.	No comments.
SHOULD BE	Constructive improvements based on analysis should be put into operation as soon as possible. Analysis is an important element in order to provide way to determine when to revise catalogs.	No comments.

Sub-Activity XI-2 (continued)

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
SHOULD BE	Absolutely essential if we are to maintain job relevant objectives.	
	This is another critical activity.	
	This activity is critical to success of effort.	
	Since updating technical materials has been a problem, we should attempt to reduce the time lag.	
	Analysis yield is of top importance.	

Sub-Activity XI-3--Conducting New Task Analysis

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
	Programs will be no better than their currency.	Doubt there will be a great change in 24 months.
	Essential to maintaining concurrency of materials.	Not as critical as some other activities.
IS	Current information is vitally needed at all times.	
	Must keep analysis up to date to determine changes in skill and knowledge levels required by the occupation.	

Sub-Activity XI-3 (continued)

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
SHOULD BE	Programs will be no better than their currency.	Doubt there will be a great change in 24 months.
	Absolutely essential to maintain job-relevant objectives.	Not as critical as some other activities.
	Essential to maintaining concurrency of materials.	
	Current information is vitally needed at all times.	
	Must keep analysis up to date to determine changes in skill and knowledge levels required by the occupation.	
	Should encourage revision and update to keep technical materials up to date.	
	New task analysis of top importance.	

Sub-Activity XI-4--Decision Criteria for Revising and Updating Catalogs

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
IS	Critical for updating programs.	Doubt there will be much change in 24 months.
	Data should provide basis for measuring respondent reliability as well as reflect job content change since first survey.	After all data are in, this should be an automatic, routine component.

Sub-Activity XI-4 (continued)

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
SHOULD BE	No comments.	After all data are in, this should be an automatic, routine component.

Activity Number XII
Third Party Evaluation of the Vocational-Technical Education Consortium of States

Sub-Activity XII-1--Selection of the Evaluation Team

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
	Critical evaluation will reinforce entire system.	Select on the basis of the best qualified bidder.
IS	Strong third party evaluation is essential to the quality of the products.	Eliminate term "qualified low bidder."
	The nature of V-TECS demands accountability	
	Critical evaluation will reinforce entire system.	Eliminate term "qualified low bidder."
	Critical to success.	
SHOULD BE	Strong third party evaluation is essential to the quality of the products.	
	Evaluation and dissemination is often the weak link and needs more stress.	

Sub-Activity XII-1 (continued)

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
SHOULD BE	The nature of V-TECS demands accountability.	

Sub-Activity XII-2--The Evaluation and Report of Results

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
	Support and additional resources will come from use of these data.	Evaluation reports are often filed and not used to their fullest.
IS	Current emphasis on evaluation and accountability make this of high importance.	Premature to decide who is to get copies.
	Strong third party evaluation is essential to controlling quality of the products.	
	Great value should be placed on the worth of disinterested party evaluation.	
	Nature of V-TECS demands accountability.	
SHOULD BE	Support and additional resources will come from use of these data.	Premature to decide who is to get copies.
	Critical to success.	
	Strong third party evaluation is essential to controlling quality of the products.	
	Important in order to strengthen evaluation and quality assurance.	

Sub-Activity XII-2 (continued)

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
SHOULD BE	Great value should be placed on the worth of disinterested party evaluation.	
	Nature of V-TECS demands accountability.	

Sub-Activity XII-3--Implementation of the Recommendations of the Evaluation

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
	Purging the system is important to eliminate bad practices.	
IS	Strong third party evaluation is essential to controlling quality of the products.	
	Constructive advice will lead to a better Consortium.	
	Evaluation must be used to its fullest.	
	Nature of V-TECS demands accountability.	

Sub-Activity XII-3 (continued)

	Positive Comments Above Most Frequent Response:	Negative Comments Below Most Frequent Response:
	Purging the system is important to eliminate bad practices.	No comments.
SHOULD BE	Strong third party evaluation is essential to controlling quality of the products.	
	Evaluation must be used to its fullest.	
	Nature of V-TECS demands accountability.	

VITA

Benjamin Ardell Hirst, Jr., the son of Ben A. and Atlee B. Hirst, was born May 7, 1935, at Nashville, Davidson County, Tennessee. He attended the public schools of Nashville and Davidson County and was graduated from Nashville Central High School. He served as a machinist in the U. S. Navy from August, 1952 until April, 1956 and received the Korean Service Medal, United Nations Medal, and the National Defense Medal. He attended Middle Tennessee State University in Murfreesboro and received a B.S. Degree in Industrial Arts Education in 1959. He was employed as a tool and die maker for AVCO Corporation in Nashville for three years before returning to work on a graduate degree at Middle Tennessee State University. He was employed by the Decatur County School System in July, 1962 as a machine shop instructor. While teaching he continued work on the M.A. Degree and graduated in August of 1963 with a Master's Degree in Educational Administration.

On June 1, 1964, he was employed as a supervisor in the Area Vocational-Technical Schools, Tennessee State Department of Education. He served for two years in this position and was promoted to State Director of Area Vocational-Technical Schools. In August of 1967, he was promoted to State Coordinator of Area Vocational-Technical Schools and held the position until September 13, 1971.

In April of 1971, he was selected as a recipient of a National Education Professions Development Act fellowship to study for the Doctorate degree in Vocational-Technical Education at The University

of Tennessee, Knoxville, Tennessee. The major emphasis of the Doctoral program was administration of vocational-technical education with a minor emphasis on educational administration and supervision.

On November 13, 1972, he was employed as a project director by the Southern Association of Colleges and Schools' Commission on Occupational Education Institutions to conduct feasibility research and direct the formation of a multi-state consortium. Effective July 1, 1973, he became the executive director of the Vocational-Technical Education Consortium of States (V-TECS). He received his Doctoral degree in August of 1974.

He is a member of the American Vocational Association, American Welding Society, National Society for Performance and Instruction, Phi Delta Kappa, Kappa Delta Pi, and an inductee in Iota Lamda Sigma Industrial Education honor society.

He is married to the former Bettye Rose Gurley and has six children.