DOCUMENT RESUME

ED 146 346 CE 012 502

AUTHOR Kempton, Robert F.; And Others
TITLE Specifications and Model Format for the Curriculum Products.
INSTITUTION National Evaluation Systems, Inc., Amherst, Mass.
SPONS AGENCY Illinois State Office of Education, Springfield. Div. of Adult Vocational and Technical Education.
NOTE 44p.

EDRS PRICE MF-$0.83 HC-$2.06 Plus Postage.
DESCRIPTORS *Curriculum Design; *Curriculum Development; Curriculum Planning; Guides; Instructional Design; *Instructional Systems; Material Development; *Models; Program Evaluation; *Systems Development

ABSTRACT

This instructional systems planning guide presents specific criteria for developing a complete instructional program, as well as a method for designing the program. Chapter 1 presents an overview of curriculum development. Chapter 2 provides a brief description of each major activity in the process of curriculum development, which includes conducting a feasibility study and a task analysis; developing measurable objectives, criteria instruments and learner activity materials; validating individual modules, implementing and testing the system; and conducting a followup on completers. Each major activity is presented in the following format: purpose, activities, product, and discussion. Chapter 3 presents the operational process of developing curriculum. A flowchart is first presented, followed by a series of activities listed for the accomplishment of each step in the process. A cover sheet for personnel assignment and delineation of job parameters is also provided. In chapter 4 a suggested format for the final curriculum product is outlined in ten sections. A glossary of concepts and terms associated with an instructional systems development approach concludes the guide. (BL)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED146346

SPECIFICATIONS AND MODEL FORMAT FOR THE CURRICULUM PRODUCTS

PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Illinois State Dept. of Ed.

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND THE ERIC SYSTEM CONTRACTORS

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Illinois Office of Education
State Board of Education
Joseph M. Cronin, Superintendent
Department of Adult, Vocational and Technical Education
100 North First Street
Springfield, Illinois 62777

Robert F. Kempton, Principal Researcher
Risa W. Selig, Editor
Richard G. Allan, Ed.D., Project Director
Margaret A. Ross, Project Manager

CE 012 252

ACKNOWLEDGEMENTS

The enclosed model is a synthesis of the best features of a number of existing instructional systems development models. This model was prepared by National Evaluation Systems, Inc. (NES) for the Illinois Office of Education. We would like to acknowledge the pioneering efforts made in this area by the following:

The United States Air Force

The United States Army

The Washington Vocational Curriculum Management Center

The American Institute for Research

F. Coit Butler

Special thanks go to the following AVTE personnel for their contributions and assistance in this project: Peggy Poole, Contract Administrator, Professional and Curriculum Development Section; William Reynolds, Manager, Professional and Curriculum Development Section; and Gerry Geadtka, Head Consultant, Occupational Consultant Section.

We are especially grateful for the support and efforts of Gay Flannelly and Wendy Feldman, of our secretarial staff.

TABLE OF CONTENTS

CHAPTER 1

OVERVIEW OF CURRICULUM DEVELOPMENT

An instructional system is both a process and a product. By using the attached planning guide, developers have specific criteria for developing a complete instructional program, as well as a method for designing the program. Throughout the description of the Instructional Systems Development process and its related product, the ideal process and optimum product will be described. Realistically, there can be no such instructional system. System design and development are always a series of minor compromises in which one desirable characteristic is partially traded off for another. The intent of Instructional Systems Development is for developers to arrive at the best possible mix of desirable features based on available resources.

When the principles and methods of Instructional Systems Development are applied to entire curricula and across the entire instructional spectrum, the result is an empirical process for the analysis, design, development, and evaluation of training. The key to the process is the identification of the desired performances, the specification of what controls these performances, and the determination of the techniques needed to achieve those performances.

This process is designed so that the needs of students with individual differences, or special characteristics are considered. General knowledge concepts as well as skills will also be included in the curriculum through the use of this approach.

Note that this approach is designed to be flexible and complete. It is not intended that every curriculum development project will encompass all of the steps listed due to normal resource and time limitations. However, it is important for the contractor and the Department of Adult, Vocational and Technical Education (AVTE) to know how much of a total job is being done and how much is not being done.

CHAPTER 2

DESCRIPTION OF THE CURRICULUM PROCESS

A brief description of each major activity in the process of curriculum development is provided. This process is all-inclusive and exemplary. Each project should have parameters defined as time and resources may not be available for the completion of all of these activities.

1. CONDUCT FEASIBILITY STUDY

- Purpose: To determine if there is a need for the curriculum to be created.
- Activities: Review current trends to identify future labor projections in the field and to determine the usefulness of a vocational training program to meet labor needs.
- Product: A short report clearly indicating that research has shown the need for the vocational training program to be developed.
- Discussion: The feasibility study requires three levels of analysis. Firstly, one must make an initial selection of a cluster or family of occupations (sometimes called job family) that are horizontally interrelated with skills required and knowledges generalizable across the cluster. Most of the training received for a representative occupation can be transferred to other related occupations within the

cluster. Secondly, a task-related occupation hierarchy must be developed and described, and the vertical relationships among the different levels of occupations within the family established. Finally, a careful analysis is made of each occupation within the hierarchy and a decision is reached concerning the feasibility of the overall training program. All phases of the study are carried out simultaneously because the information developed and the decisions reached at each stage are highly interdependent.

During the initial stage of the feasibility study, elementary descriptions of the occupations under consideration are developed using functional occupational analysis techniques. Occupation descriptions provide data which are useful in defining the performance and capabilities required of an incumbent, thus aiding the curriculum developer in assessment of the characteristics of the occupation and its relationship to other occupations.

2. CONDUCT TASK ANALYSIS

- Purpose: To identify the skills and general knowledge concepts required for job performance at entry, intermediate and advanced levels as the focus of the instructional program.

- Activities: Survey existing documents and training materials, interview employers and employees, as well as other content specialists in the field.

- Product: A listing of tasks (related to skills and concepts) at three levels to show occupational ladder progression and to serve as the basis for program objectives.

- Discussion:- Once the feasibility study has been completed, and the decision has been made to develop a particular training program, the task analysis must be conducted. Since it provides the substance for the content of training, the task analysis suggests the sequencing and form of training, and also serves as a statement of the performance criterion which will be used to evaluate both the training and the students.

Task analysis is the fundamental source of training objectives. The degree of detail needed for a task analysis in systems development is much greater than that normally associated with job classification manuals and training literature. A task analysis should be detailed enough to provide minimal step-by-step directions and guidance that a student in training needs to complete a task successfully.

The task analysis must also identify working conditions and environmental situations which might affect job performance. Any special precautions and possible alternatives must be listed for each task. Also, special materials, test equipment, and manuals should be identified. If there are critical time and accuracy demands, they should be listed.

The task analysis is completed when tasks are organized in a hierarchy for each major skill required of someone trained in performing the job. The curriculum developer must determine the level of specificity required in the task analysis.

3. DEVELOP MEASURABLE OBJECTIVES

- Purpose: To state what students are expected to learn as a result of instruction.
- Activities: The task analysis is carefully reviewed and forms the basis for developing a series of student measurable objectives, to be written by curriculum specialists and reviewed by content specialists. Tasks should be arranged in a sequential instructional order and organized under major competency areas before objectives are written.
- Product: A list of objectives which will form the focal point of all instructional development.
- Discussion: Once the task analysis is completed, measurable objectives from the information derived in the task analysis are developed.

Measurable objectives describe what the students will be expected to know and do as a direct result of the training. Objectives are comprised of three parts: standards, conditions, and criteria of performance. The objectives form part of a guidance component for each

program. The instructional system-designer must have this information in order to make decisions regarding content, sequence, method and media. Explicitly stated measurable objectives are also required by vocational educators, instructors and students.

4. DEVELOP AND VERIFY CRITERION INSTRUMENTS

- Purpose: To develop a series of measurement materials which determine whether students are learning the objectives.

- Activities: The objectives are carefully analyzed to ascertain the best type of measurement instrument. The instruments are then produced, verified and field-tested.

- Product: A series of criterion-referenced tests, questionnaires and performance check lists are available to measure student success in learning the objectives through use of the instructional materials.

- Discussion: The criterion instruments (tests measuring the objectives) are intended to serve a number of important functions, including serving as major instruments for formative system evaluation. A primary concern in the development of proficiency measures is the development of test instruments which measure specific, observable events appropriate to the purpose of measurement. Criterion-refererenced measures involve a comparison between system capabilities and individual performance.

Proficiency measures which reflect a continuum of attainment usually imply cumulative levels of achievement, in that a person at mastery level is also proficient at the tasks required at entry and intermediate levels of performance. Measures which assess performance in terms of criterion standards provide information as to the degree of competence attained, which is independent of the performance of others. Additionally, such measures provide information necessary to correct deficiencies in the content and sequence of learning activity materials.

In summation, the objectives state what the students are to have learned at the conclusion of instruction. The criterion-referenced measurement instruments provide feedback on the success levels of students in learning the objectives. This information is necessary to improve the curriculum until it is an effective instructional vehicle. The measurement instruments can also be made available to instructors for student and program assessment after systems implementations.

5. DEVELOP LEARNER ACTIVITY MATERIALS

- Purpose: To develop materials which present information to the students and which otherwise support teaching so that the measurable objectives are learned by students.
- Activities: Analyze the objectives to determine the best instructional approach(es), prepare instructional materials (including

teaching guides), provide supporting documentation and have all materials reviewed for content accuracy.

- Product: A series of instructional materials designed to teach (or support teaching of) the objectives.

- Discussion: Although the outward form of learner activity materials (learning units and lessons) may vary considerably, the internal design should always include the following structural elements.

1) An exact description of what the student is to do as a direct result of the learning activity called for by the lesson (i.e., the measurable objectives).

2) A statement of the function and applicability of the knowledge and skills to be gained from the unit.

3) A list of materials, supplies, equipment, training, aids, technical and service manuals, textbooks, etc., that are needed by the student to carry out the prescribed activities.

4) A guide for the acquisition of the skills and knowledge specified by the measurable objectives.

5) A means of providing interim checks and self-evaluation with immediate feedback for the student.

6) An instrument, capable of serving as a pre-test and/or a post-test, with which the instructor and/or learner can evaluate, certify and record the attainment of the terminal behaviors.

The overall length of each unit is, of course, determined by the objectives of that unit. Behaviorally stated measurable objectives and their associated criterion-referenced test items specify the content, method, standards, and setting of the learning activities. Thus, the learning activity materials must create a situation both for learning and assessment purposes, a situation that calls for realistic, hands-on, job performance activities.

Additionally, a career guidance component should be included in the materials designed for use by the teacher (or guidance personnel). The guidance component should indicate general educational development requirements, job demands, and specify the worker trait groups for job families as delineated in the Dictionary of Occupation Titles (D.O.T.). This information is vital for matching students with programs that reflect their interests and capabilities. Also, job options should be indicated.

Within the confines of the above guidelines, the system developer is still left with considerable latitude as to content and format for

the learning materials. Just as in the case of media selection, there is no single learning unit format that is best for all objectives. Format should vary to conform with the requirements of the measurable objectives.

6. VALIDATE INDIVIDUAL MODULES

- Purpose: To determine if the instructional materials teach the students for whom they were designed.

- Activities: Try out the instructional materials on small groups of students. Carefully observe their reactions. Also collect assessment data using the evaluation instruments. Modify the materials as necessary.

- Product: A series of instructional materials which successfully teach the measurable objectives.

- Discussion: The instructional system is not produced in its entirety and then tested; rather, it is tested as it is being produced. During this production phase, all the system training materials are developed — texts, study guides, workbooks, and the supporting training media. Each unit of instruction is first applied on an individual basis to a few sample students who are representative of the target population. The designer should pick only those individuals who fall within the range of aptitudes, prior knowledge, skills, background,

and attitudes displayed by the target population. If the sample does not fall within this range, the results will be biased and any generalizations from the sample to the target population will be in error. However, using the more capable students within the target population is advisable at this stage of testing. The more capable students (as revealed through comprehensive testing of abilities and aptitudes) within the target population often can help point out and analyze weak spots in the instruction. Moreover, if the more capable students cannot learn from the material, the less capable students certainly will not.

The performance data from the criterion test serve as a guide for revisions. Clusters of errors definitely indicate need for revision. Analysis of the pattern of errors helps to pinpoint the problem areas. If the students fail to perform a particular terminal objective on the criterion test, the instruction leading to that objective needs revision. Failure to perform some of the interim objectives leading to that terminal objective indicates exactly where the breakdown occurs. If the need for revision is apparent after two or three tryouts, the designer must then make the necessary changes before proceeding with any more testing. On the other hand, if the unit is fairly effective and does not require too much revision, the unit should then be given to a group of students who cover the range of abilities of the target population.

The final step in the validation process is trying out the unit on several groups of students under conditions that are as close to actual training as possible. A reasonable time allowance for a unit of instruction is the average time taken by the first 85% of the sample population to complete the unit. The goal of the designers is to produce instructional units which should enable 85% of the students to achieve all the objectives. However, there may be units where it is necessary for 100% of the students to achieve the objectives.

With the completion of the test/revise cycle for each unit in the system, the development process has come to an end. The system designer's role continues through the implementation and field testing of the system.

7. IMPLEMENT AND TEST THE SYSTEM

- Purpose: To test the effectiveness of the entire system, including instructional materials, teaching guides, logistics and management.
- Activities: Implement the entire system to a group of 30 students, then to several groups, to see if it is teachable and practicable. Collect data and modify as necessary.
- Product: An effective system that facilitates student accomplishment of stated objectives in a manner that can be implemented in a school (or other) setting.

- Discussion: There can be no one set guideline for implementing the wide variety of vocational training programs in all settings; only general guidance is valid. The capabilities and limitations of a system are not readily apparent to the instructors who will be a part of the system. However, implementation information is crucial for effective system operation and should be furnished in an instructor's manual. The information presented in the manual must show the user how the system was developed, what specifically it teaches, how effective and efficient it is, and how it can best be implemented. The topics that should be covered are: course description, population description, measurable objectives, criterion tests, system performance data, and a description of how the system can be most effectively and efficiently used. The needs of special groups of students, i.e., special education, handicapped, and gifted, can best be met through adherence to individualized self-paced learning within an instructional program. However, individualized learning is as much a matter of personal commitment as it is a methodology. The instructional systems development process for developing curriculum and delivering instruction can be easily adapted to an individualized approach, but in-service training should be provided to all parties-at-interest.

The instructor, as part of the system, must be encouraged to constantly better the performance of the system. No training system will work unless the instructors are involved in the process.

Neither the system designers nor the instructional staff should expect to implement a newly designed system without running into problems that will call for some revision. Local conditions will always affect the system to some degree. Therein lies the advantage of the systems concept since an instructional systems process allows for adaptation to local and changing needs. Feedback from continuous criterion performance testing provides a built-in mechanism for adaptive self-correction. A training system is never a finished product; rather, it is a continuing process for meeting the differing and changing needs of the individual student. Feedback should also be obtained on the career guidance component of the system for usability.

8. FOLLOW-UP ON COMPLETERS

- Purpose: To determine the long-range effectiveness and usefulness of the system.
- Activities: Survey successful program completers to determine if objectives were valid and relevant for them.
- Product: Data to modify or revise systems over time if necessary. This step is the key to keeping the system dynamic rather than static.
- Discussion: If vocational education is to become an instructional system capable of providing the social community with a predictable

product, that product must be measured against the measurable objectives set by the community through the task analysis. Therefore, an important part of the job of vocational educators is to plan and carry out regular follow-up studies on all students who have left school to enter the world of work. The goal of such studies is to provide the school with the evaluative feedback on product performance against which to judge past system performance, and with which to plan for future system adaptation to the changing needs of the community and the students. Like all production systems, an instructional system is judged finally by the quality of its product.

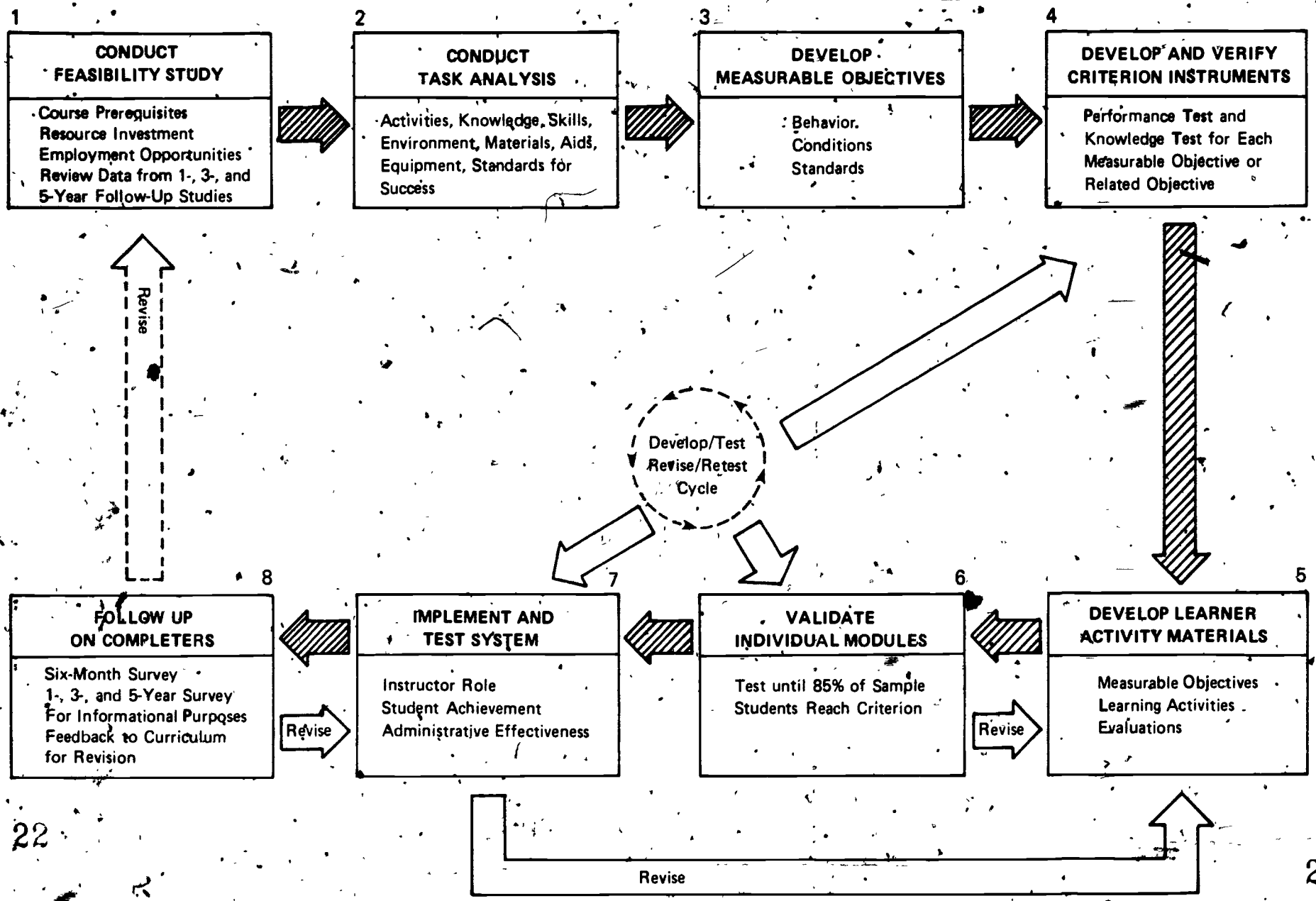
In essence, internal evaluation during system development ensures that instructional materials teach the stated objectives. After implementation, external evaluation (student follow-up) should be initiated to see if system objectives are appropriate or should be modified.

CHAPTER 3

ACTIVITIES IN THE CURRICULUM PROCESS

This chapter operationalizes the process of developing curriculum. The process is first depicted visually in a flowchart. Then, a series of activities are listed for the accomplishment of each step in the process. A cover sheet for personnel assignment and delineation of job parameters is also provided. The activities in this process are all inclusive. The project monitor and curriculum developer should, at the inception of the project, agree on which activites can be performed within project parameters. These agreed upon activities should then form a list or outline of tasks for the curriculum developer.

INSTRUCTIONAL SYSTEMS DEVELOPMENT PLANNING GUIDE FLOWCHART



Occupational Area: _____

Job Family: _____

Level Under Development: _____

Project Director: _____

Project Title: _____

AVTE Assigned Personnel: _____

Location: _____ Starting Date: _____

* Certification by Project Director

• Review by AVTE Staff

\+ Certification or self-check by instructor or writer

NOTE: Each task or phase, when completed, *must* be certified with the initials of an authorized official and the date of completion of certification.

* 1. CONDUCT FEASIBILITY STUDY

- 1.1 Focus on and select occupations which, in comparison to related occupations, require a larger range of skill levels and performance of a wider variety of tasks.
- 1.2 Focus on and select occupations which require an appropriate amount of vocational training time (given various limitations of schools).
- 1.3 Focus on and select occupations which have entrance, apprenticeship, or on-the-job training requirements which can be better met as a result of vocational training.
- 1.4 Focus on and select occupations which are appropriate in terms of cost, size, support requirements, staffing, and expected usage of training facilities and training equipment.
- 1.5 Focus on and select occupations for which the skills and knowledges which will be required in the next five years are predictable.
- 1.6 Focus on and select occupations which have favorable employment projections.
- 1.7 Determine and document the availability of research information and materials applicable to the developmental stages and processes.
- 1.8 Detail recommendations with supporting documentation (including cost projections, equipment and materials requirements, etc.).
- 1.9 Verify feasibility study (advisory committee, panel of experts, and project officials).
- 1.10 Initiate policy review, decisions, action.
- 1.11 Complete necessary modifications.
- 1.12 Determine appropriate curriculum for handicapped and special needs students.

2. CONDUCT TASK ANALYSIS

- 2.1 Enumerate occupation titles for entire area under development.
- 2.2 Group and arrange occupation titles according to hierarchy of skills, knowledges, and training time from all sources including D.O.T.
- 2.3 Cluster occupation titles by groups according to analyses of tasks horizontally and vertically within the hierarchy.
- 2.4 Select representative occupations (for training vehicle) for each area under development and produce a flowchart illustrating milestones or exit levels within the hierarchy.
- 2.5 Develop an occupation-description document for the first exit level. Must include definition of population, statement of purpose, segments, functions, and contingencies. Must also include a preliminary and tentative task classification-enumeration by basic (job-entry level), advanced, specialty, auxiliary, and redundant categories.
- 2.6 Develop questionnaire-observation instrument(s) for validation of occupation description and task classification. (Data to be collected should enable a ranking by frequency of tasks performed by each pay or job level. Critical tasks which involve safety or equipment-damage factors should be identified. Other data and information may be necessary.)
- 2.7 Verify (in the field) occupation description and task classification-enumeration. Collect and analyze data and finalize job description and task classification-enumeration.
- 2.8 Prepare *ISD Progress Chart* matrix showing estimated person-hour requirements by basic job task for each developmental phase.
- 2.9 Review recommendations. Review estimates on person-hour projections, costs by category, scope of work, schedule of work, personnel needs, equipment and material requirements, etc. Review policy decisions.

* 3. DEVELOP MEASURABLE OBJECTIVES

- 3.1 Formulate terminal measurable outcome statements, by occupational tasks, for each *basic* task identified in job description. (Can usually be secured from the military, industry, or other sources. This is a most difficult step. It requires skills not expected of teachers. It should not be attempted until all possible resources have been explored. Sub-contract if possible.)
- 3.2 Complete breakdown of each terminal measurable objective to the level of specificity required to build criterion-checklist instruments for the performance evaluation and analysis. (Sub-contract if possible.)
- 3.3 Organize concept objectives into enabling, enhancing and enriching competencies necessary for the occupation.
- 3.4 Develop criterion-checklist instruments for each major measurable objective.
- 3.5 Submit criterion-checklist instruments to panel of experts. (This should result in a detailed review of the criterion specified within each measurable objective—i.e., a review of the job standards.)
- 3.6 Make necessary adjustments.

* 4. DEVELOP AND VERIFY CRITERION INSTRUMENTS

(Each of the following milestones is in reference to a specific sub-objective. The process *must* be replicated for each objective. Start with the easiest job task.)

- 4.1 Design "hands-on" (pre- and/or post-assessment) *Performance Activity* section (or alternative simulation, graphic, paper-and-pencil situations). Should have flexibility for use in "live" situations if possible. Must include carefully structured check points (*Stop _____ Instructor Check*) at appropriate points. Include test questions and response items where necessary. Check reading level. Estimate time requirements and adjust modules accordingly. Check for possible interdependence of sequenced responses.

- 4.2. Identify and prepare specifications for mock-ups, samples, simulators, and other physical devices required for realistic skill and knowledge assessment.
- 4.3 Prepare criterion-referenced test items; organize and key for self-scoring. (Critical information—pre- and/or post-assessment section. Sub-contract if possible.)
- 4.4 Specify all materials and equipment required.
- 4.5 Combine objectives where necessary to build functional modules (*Performance Evaluation Sets*).
- 4.6 Acquire, organize, and operationalize all instructional materials, mock-ups, samples, simulators, equipment, etc.
- 4.7 Print instruments complete with instructor checklist, art work, and illustrations.
- 4.8 Submit criterion-performance test instruments (*Performance Evaluation Sets*) to panel of experts.
- 4.9 Test-revise-retest to specifications on experienced and inexperienced populations. (Validations may be possible given an adequate number of test subjects and appropriate research procedures.)

* 5. DEVELOP LEARNER ACTIVITY MATERIALS

(Each step refers to each module. The process must be replicated for each module.)

- 5.1 Specify prerequisite performance certification.
- 5.2 Establish standards for objectives.
- 5.3 Write brief (one or two sentences) overview (comments, etc.).
- 5.4 Specify student-instructor contract options.
- 5.5 List materials and aids which must be collected by the student prior to or during the evaluation activities. (May be organized by Tote-Trays or training stations.)

- 5.6 Specify optional resources for enrichment activity.
- 5.7 Print guides.
- 5.8 Determine need for *new instructional materials* development. Prepare specifications. Prepare rationale, documentation and recommendations. Prepare person-hour projections and cost estimates. Detail alternatives and consequences. Detail management-developmental plans. Submit for policy decisions. Initiate action as required. (Avoid if at all possible—this is a very expensive project. The range of activities here could vary from the simple collection and preparation of outline steps to large and quite complex developmental efforts. The degree and sophistication of R&D will depend on the level of investment.)
- 5.9 Develop career guidance component. Pull together and organize, for use by teachers, administrators and guidance personnel, information related to the career of interest. Include worker trait groups from the D.O.T., qualification profiles for the job family, general educational development (GED) requirements, aptitude and job performance requirements and career options available based on worker trait skills acquired through the program.
- 5.10 Submit to panel of experts and supervisor.
- 5.11 Make necessary adjustments.

* 6. VALIDATE INDIVIDUAL MODULES

(Each step is in reference to each module. The process must be replicated for each module—one at a time. Again, start with the easiest basic task. NOTE: Validation may be possible given an adequate number of test subjects and appropriate research procedures.)

- 6.1 Place into operation as specified, all training aids, mock-ups, simulators, samples and other such devices for *each module* or *unit* prior to testing of respective units.
  - + Analyze specifications.
  - + Secure or build components.
  - + Mark, label and identify as specified.
  - + Keep spares of appropriate items ready for immediate substitution.

- 6.2 Assemble Tote-Trays, kits, or panels of specified materials and equipment.

  + Analyze specifications.
  + Secure and organize as specified.
  + Attach inventory list to each "set."
  + Keep spares of appropriate items ready for immediate substitution.
  + Provide duplicate sets for those activities which are most likely to be performed by more than one student at the same time.
  + Complete requirements for each unit or module prior to testing or use.

- 6.3 Assemble references, manuals, guides, catalogs, etc.

  + Analyze requirements.
  + Secure and organize as specified for each unit prior to the testing of respective modules.
  + Keep spares of appropriate items ready for immediate substitution.

- 6.4 Review each module word-for-word before testing or use.

  + Check for proper placement, organization, and labeling of all aids, materials, references, etc.
  + Analyze requirements for instructor evaluations and check-points.
  + Check safety considerations against state, local and school requirements.
  + Check condition of equipment, room arrangement, condition of materials, ease of supervision and observation, etc.
  + Check for possible interference (from or to) other activities.

- 6.5 Test each module on target population according to research plan. Test/revise/retest until 85%* of population reach criterion.

  + Try out questionnaire "Characteristics of Test Group" to potential candidates of target group. Identify students by name on form.

  + Analyze returns for target group typical of those needing and electing training. Select group for testing. (Exclude those who are taking the course because the one they wanted was not available. Exclude those who do not intend to find employment in occupations related to the job family. Exclude those who might qualify for the experienced group.)

  + Test only those units which are completely operational with all aids, materials, equipment, references, evaluation devices, etc.

  + Determine actual time required to complete module (record on module).

  + Accurately complete all instructor evaluation checks of student performance. Administer *Student Reaction Form* immediately after student completes module and Criterion Checklist.

  + Try out each unit, if at all possible, with at least two or more persons from the target group.

  + Upon completion of test, complete *Teacher Reaction Form* for each unit. Detail on attached copy of unit all necessary information.

  + Complete all units, response cards, information forms, reaction forms, and checklists. Review with research team.

- 6.6 Submit to panel of experts and school officials.

- 6.7 Make necessary adjustments.

---

*This is a suggested figure only. The percent of acceptable achievement may be set higher or lower for various programs.

* 7. IMPLEMENT AND TEST SYSTEM

- 7.1 Define instructor role and tasks. Review evaluation checklist on instructor performance.

- 7.2 Develop and print *Occupational Readiness Record* and *Course Activities Guide*.

- 7.3 Organize student tracking system.

  + Master teacher chart not accessible to students.

- 7.4 Organize distribution and materials handling system.

  + Determine central distribution center for Tote-Trays, materials and supplies, references, performance evaluations, etc.

  + Provide compartmentalized containers for performance evaluation units organized and labeled for student management.

  + Develop daily inventory system operable by a student assigned to distribution center.

- 7.5 Obtain adequate supply of student materials (complete sets) including *Performance Evaluation Sets*, learning materials (as specified), *Occupational Flow Chart* and *Selected List of Occupations*, and *Job Description* and *Task Analysis* for first level.

- 7.6 Complete state, local and school requirements for shop management and organization, supply acquisition, soap and towels, rags, clean-up schedule and assignments, rules and regulations, etc.

- 7.7 Adhere to sequence designed into course.

- 7.8 Follow sequence of modules where designed.

- 7.9 Administer *Performance Evaluation* module within one or two weeks to students taking learning units or other learning activities (those who did not attempt or take the performance evaluation as a pre-test).

- 7.10 Administer *Performance Evaluation* modules as pre-tests to all students who indicate an ability to complete the tasks at the specified minimum level of acceptable job entry performance (with safety factors taken into consideration).
- 7.11 Service all student requests for instructor checks.
- 7.12 Secure various observers to analyze student-teacher interactions, course management (internal design), interference factors, etc.
- 7.13 Try out, on a random basis, *Student Reaction Forms* (two per unit of 20 students).
- 7.14 Complete *Teacher Reaction Form* for each *Performance Evaluation* module.
- 7.15 Review, with research staff, copies of the *Criterion Checklist* from all *Performance Evaluation* modules, complete with time required to complete module (recorded on each *Criterion Checklist*).
- 7.16 Review, with research staff, copy of instructor's *Master Student Progress Chart* showing modules completed (both *Performance Evaluation* modules and learning activities).
- 7.17 Test/revise/retest. Modify materials and environment accordingly. Review instructor role, student achievement, and administrative effectiveness.
- 7.18 Review career guidance package.
- 7.19 Present for review to panel of experts and school officials.
- 7.20 Make necessary adjustments.

* 8. FOLLOW-UP ON COMPLETERS

- 8.1 Conduct six month survey on all completers (six months in the work force).
  - + Administer *Vocational Student Survey Questionnaire.*
  - + Administer *Employer Questionnaire.*

+ Administer *Instructor Checklist* in field (check for retention and valid objectives).

+ Review results and prepare recommendations for review by school officials and research team.

- 8.2 Review task analysis and instructional objectives.
- 8.3 Review by advisory committee, panel of experts and school officials.
- 8.4 Revise and modify system as required (or detail recommendations with cost revision estimates where policy decisions are indicated).
- 8.5 Establish procedures for continuation of systematic follow-up and revision-evaluation system to ensure regenerative aspects and continued flow of corrective feedback information.
- 8.6 Complete *Instructor Manual*.
- 8.7 Complete requirements for diffusion.
- 8.8 Prepare for development of next performance level.

CHAPTER 4

SUGGESTED FORMAT OF THE CURRICULUM GUIDE

A process for developing curriculum has been delineated in previous chapters. This chapter suggests a format for the final curriculum product. This format is designed for flexible application. Not all suggested sections must be used for all curriculum development projects. Selectivity and modification are options to be exercised as required.

PREFACE: A very tightly written description of the format of the guide and an overview of each section.

SECTION I: A Review of the Background and Development of the Curriculum Guide

- Discuss task analysis used to generate employer-based validity for the curriculum guide.
- State the structure and development of the guide.
- Briefly review information on the career field.
- List advisory committee, panel of experts, and project officials and provide acknowledgements of their contributions. Discuss AVTE's role and consultative status. Discuss process used to insure employer-based validity.
- Discuss competency-based nature of the guide.

Review how to plan a course of instruction.

- Examine entry-level task inventory.
- Rank tasks in order of importance.

- Sequence entry-level task inventory.
- Select general knowledge concepts that support both the broad competency areas of the curriculum and the tasks to be learned.

Discuss briefly how to develop instructional units.

- Review basic principles of learning.
- Examine process for developing learning activity packages.
- Select methods of instruction and supporting activities.

Discuss selection and placement of students.

- Review guidance considerations.
- Coordinate activities.

SECTION II: General Job Description of the Vocational-Technical Field

Discuss the nature of work; places of employment; training, other qualifications and advancement; employment outlook; earnings and working conditions; and sources of additional information on the vocational-technical field.

SECTION III: Inventory of Job Tasks and Measurable Objectives at the Entry-level of Job Performance for an Entry-level Title Job

Present the list of tasks and objectives for the vocational-technical field at entry level. These tasks and objectives represent the significant learner outcomes of the training program and thus are the core materials upon which curriculum and instructional development efforts can be based.

Discuss the job family concept and the generalizability of the tasks from the entry-level title job to other jobs in the job family.

List tasks sequentially and break each task down into job or performance steps. Measurable objectives should list the conditions, i.e., materials and equipment used in the performance of the objective and the standard of achievement to be used in assessing successful completion of the objective.

Organize tasks under general competency-areas, i.e., worker trait groups where possible. Worker trait grouping is a desirable way of organizing tasks because it relates to comprehensive listings of abilities, personal traits, and individual characteristics necessary for a worker to achieve successful job performance, and can be found in the D.O.T.

If the vocational-technical area is highly cognitive in nature (i.e., social service), rather than psychomotor in nature (i.e., building maintenance), this section should also contain a listing of general knowledge concepts which support the performance required in the particular vocational-technical field at the entry level. The general knowledge concepts should correspond to the important attitudes, values, and background knowledge inherent in the vocational-technical area. They can be used in conjunction with tasks to develop learning activity packages. They form the academic grounding for effective performance of the job tasks. Many concepts relate to topics that may be taught in allied academic courses. The general knowledge concepts should be organized, as well, under worker trait groupings where possible. Where worker trait groupings are not feasible because of limitations in the data base, then general knowledge concepts should be organized under three major competency clusters:

- Enabling Competencies: These competencies are considered as "fundamentals" for the entry-level worker.
- Enhancing Competencies: These competencies are more closely associated with "application" of basic knowledge and skills required in the delivery of entry-level performance.
- Enriching Competencies: These competencies are judged to be more closely associated with "advancement" in the career ladder context of advancement.

SECTION IV: Inventories of Job Tasks at the Intermediate and Advanced Levels. For Intermediate and Advanced-level Title Jobs

Include a review of the career ladder concept and its related considerations of horizontal and vertical job mobility.

Discuss the necessity for appropriate articulation.

List intermediate-level and advanced-level tasks for intermediate- and advanced-level title jobs.

Head each inventory by brief discussions of the work done by workers at that level in a particular field.

SECTION V: How to Develop Learning Activity Materials

Discuss the development of performance-based or competency-based curriculum utilizing functional job analysis techniques.

Show instructors how to take tasks, objectives and concepts from Sections III and IV and develop units of instruction.

Discuss the POP kits available from AVTE and show their relationship to and utilization in the development of an instructional program.

Discuss principles of learning, learning activity package development, developing learning activity packages from tasks and objectives, and provide illustrations appropriate to each of the discussion points.

SECTION VI: Comprehensive Program Implementation Guidelines

Discuss implementation in relation to change, inservice training, money, manpower, and materials.

Provide a listing of the major functions performed in implementing a course of study.

Provide sequenced performance steps for each function.

SECTION VII: How to Select an Instructional Method

Discuss the most commonly used instructional methods with an emphasis on individualized learning as the method of preference where practical or appropriate. Cite the uses, advantages, and disadvantages of each instructional method discussed.

SECTION VIII: Teaching-Learning Resources and Activities for the Instructor

Provide the instructor with a variety of instructional resources, references, and activities for use in a particular curriculum. List audiovisual resources, texts and reference materials, sources of career opportunities, and an educational development information. Learning and teaching activities for the classroom, and sources of additional information and assistance should also be included.

SECTION IX: Career Guidance for (Insert Title of the Curriculum Guide)

Discuss the career and job information pool which underlies the career guidance component of any occupation and how that information may be used to help students, teachers and administrators (i.e., guidance personnel) help match students with job training programs that are of interest and relate to their capabilities.

Discuss prerequisites for successful performance within the program of study and within the occupational field.

Define the general educational development component of vocational-technical training. Discuss the relationship of reasoning development, mathematical development, and language development for successful performance in a job. Explain how to use the GED levels for appropriate student placement in vocational-technical programs.

Discuss how to build strategies which bring the counselor, instructor, administrator, and all other parties-of-interest into cooperation in behalf of the student.

Discuss the general aptitude test battery and its effective use in placing students in programs in which they can be successful.

List a comprehensive qualification profile for the entry-level (insert title job of the occupational field).

- Show the relationship of the worker trait groups contained in the D.O.T. to the development of qualifications profiles for a job-family.
- Show the relationship of GED requirements to the qualifications profile.
- Discuss aptitude, interest, temperament, and physical demands and requirements of the job.
- Provide comprehensive worker trait group description.
- Provide an advanced GED program that can be used to remediate deficiencies found in particular students interested in, but not qualified for, particular programs of study. (The GED program would only relate to deficiencies in reasoning, mathematics, and language capabilities and most generally would relate to academic deficiencies).
- Provide a comprehensive worker trait codification system relating to specific vocational preparation.

SECTION X: Related Jobs at the Entry, Intermediate, and Advanced Levels and by Worker Trait Group

Show how broad clusters of jobs utilize common skills and knowledge which can create jobs and career mobility for students across a broad range of occupations. The lists of jobs related to the title jobs at each level of proficiency within the occupational field and the additional jobs related to the title jobs found in other occupational fields illustrate the career flexibility possible given a minimum amount of retraining. Additionally, lists of jobs related by worker trait group provide extensive occupational opportunity for students who choose not to enter the occupational field for which they have trained, but who wish to apply the skills and knowledge learned in other occupational fields.

GLOSSARY OF CONCEPTS AND TERMS ASSOCIATED WITH AN INSTRUCTIONAL SYSTEMS DEVELOPMENT APPROACH

- Adjunctive Process: A structured process which makes use of existing materials as the primary source of instruction, around which a learning guide (objectives, learning activities, etc.) is built to direct the student through the learning experience.

- Affective Domain: Deals with emotions or feelings. Described by words such as interest, appreciation, enthusiasm, motivation and attitude.

- Behavioral Analysis: See Task Analysis.

- Behavioral Objective: A behavioral objective is similar to a measurable objective, with the two seldom being differentiated. However, the connotation implies a clinical analysis of covert and overt behaviors, with a charting of stimulus-response after the task description has been completed.

- Cognitive Domain: Deals with thought processes. Described by such words as knowledge or understanding.

- Content Analysis: Identification of instructional objectives by analyzing existing tests and other existing instructional materials.

- Criterion Checklist: The portion of a performance evaluation set where an instructor records either a satisfactory or unsatisfactory rating of the student's achievement of the performance requirements of an occupational task.

- Criterion-Referenced Test Item: An evaluation which measures a student's achievement against stated objectives rather than by comparing one student to another or to a test group.

- Feasibility Study: A study conducted for the purpose of determining whether or not the instructional systems development process should be applied to a course of instruction. Factors such as course prerequisites, investment requirements, employment opportunities and the number of students to be trained are taken into consideration.

- Feedback: The function of a device which provides "knowledge of results" to the student, curriculum developers, project manager and others.

- Formative Evaluation: A kind of process research or outcome evaluation at an early or intermediate stage of activity for the purpose of discovering deficiencies and successes in the development. In education, such a process is used primarily to improve materials or a course rather than to appraise products or to compare methods and materials.

- Hands-on: Activity in which the trainee "handles" the equipment or materials required for occupational task performance. Activity-oriented learning or laboratory work in contrast to lectures, textbook reading assignments, etc.

- Individualized Instruction: Instruction which is learner-centered rather than instructor or content-centered. Students engaged in individualized instructional activities can be observed to be performing significantly differently than students in a traditional course of instruction. Choosing the task to be mastered, charting work progress, obtaining examination results and mastering tasks at an individual rate are student activities which can be clearly observed to be different from student behaviors in traditional courses.

- Instructional System: A set of interrelated, interacting, precisely controlled learning experiences that are designed to achieve a specific set of training objectives, but organized into a unified, dynamic whole which is responsive and adaptive to the individual student while fulfilling specific job-relevant training criteria.

- Iterative Evaluation: An evaluation process which is repeated time after time (i.e., test/revise/retest cycles) to assure accuracy, quality and relevancy of the training materials and program.

- Measurable Objective: A stated goal of task mastery. The statement is in reference to overt behavior (observable and measurable) and specifies the quality standards of the performance and conditions of the situation. The goal is usually derived from a task description. There are a number of methods of acquiring a description of the tasks being performed by trained personnel in the field.

- Psychomotor Domain: Deals with muscular movement. Described by such words as adjusts, turns, screws, etc.

- Occupational Cluster: A group of jobs within a particular job family.

- Occupational Family: A group of jobs which have a common core of tasks and tools and use similar raw materials.

- Regenerative: To reform, to reproduce, to renew, to restore through follow-up evaluative activities oriented toward program improvement. In vocational-technical education, evaluation systems must be especially sensitive to changes in the technology, equipment, practices and procedures, etc.

- Summative Evaluation: An evaluation process which amasses statistical information which, in one example, is used to make comparisons among products or methodologies. Experimental and control groups are usually structured for testing purposes.

- Systems Approach: A management process which is focused on system design analysis, management by objectives, technology of instruction, quality assurance and performance, and accountability contracting. The specification of events, processes, outputs, etc., with information feedback mechanisms for constant monitoring and adjustments.

- System Control Documents: Evaluation instruments and detailed checklists of tasks required of personnel involved in the instructional systems development process. Provides for quantity and quality control of work being performed at the various levels within the developmental process.

- System Development Team: The technical writers, subject matter specialists, editors and project managers engaged in a coordinated team effort utilizing the instructional systems development process.

- Task Analysis: An analysis of the behavioral implications of the task description through a clinical process which requires a thorough listing of employer-based performance requirements. This requires an analysis of overt and covert behaviors with a charting of activities performed by personnel on the job.

- Task Description: A thorough task description could be used as a procedural manual for the novice. It should enumerate all the circumstances in the stimuli and responses that can occur on the job. Task descriptions can be derived from a content analysis, by simulation, by interview (consensus) analysis, or by observation.

- Test/Revise/Retest Cycle: That portion of the instructional systems development process where individual performance evaluation and learning activity materials are systematically tested, revised, and retested prior to implementation in the classroom or laboratory.

- Validation: To confirm or prove. Usually accomplished through field testing with a population of adequate size to insure generalizability. Proof of doing that which was intended as measured against specific criteria and quality standards.

- Verification: To test or check accuracy or exactness. While the meaning is similar to the definition provided for validation, the connotation in education implies a less rigorous process with a population inadequate in size to claim validation.