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ABSTRACT

One of five modules in the administrative series of the 16-module series designed to train vocational education curriculum specialists, this module is intended for use in classes or individual study arrangements at the preservice or inservice level by students with varying amounts of experience in vocational education. (These modules are revised versions of earlier study guides--see note.) Introductory materials include an overview, instructions to the learner, detailed list of behavioral goals and objectives, and resources needed to complete learning activities. The module is divided into three sections, each based on one of the goals. Section 1 defines the role of the curriculum specialist in evaluating vocational education curricula. Evaluation is defined, three approaches to evaluation are described, and three areas in vocational education curriculum evaluation are discussed. The other two sections describe the purposes and major activities involved in evaluating a vocational education curriculum prior to its implementation (section 2) and after it has been implemented (section 3). Each section follows a standard format: text, individual study activities, discussion questions, and group activities. A summary of the module follows. Appendixes include suggested responses to the study activities, a self-check, responses to the self-check, and recommended references. (YLB)

VOCATIONAL EDUCATION CURRICULUM SPECIALIST

EVALUATING VOCATIONAL EDUCATION CURRICULA

Module 12

a project to field test vocational education curriculum specialist materials

AMERICAN INSTITUTES FOR RESEARCH

This module is based upon work done at the American Institutes for Research and Washington State University during 1974-1977 pursuant to contracts with the Office of Education, U.S. Department of Health, Education, and Welfare.

EVALUATING VOCATIONAL EDUCATION CURRICULA

Module 12

Jean Wolman

Carolyn B. Claudy

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Introduction

Evaluation is an integral part of the curriculum development process. In fact, it provides a vital monitoring system that begins in the curriculum planning stage, provides feedback during the development and early implementation stages, and provides essential information to decision-makers regarding the ultimate outcomes of a curriculum. Evaluation should be an ongoing process that provides data for management decisions both during and after implementation. Its intent is to prove outcomes, to improve the curriculum prior to and during its early implementation, and to ensure that new curricula are of the highest caliber.

The relatively recent call for accountability in education has required that teachers, students, administrators, institutions, and the curriculum itself be evaluated. The vocational education curriculum specialist must be familiar with various types of evaluation, be able to conduct or supervise curriculum evaluations, and know how to use evaluation data to improve the curriculum.

This is one of two modules pertaining to the evaluation of vocational education curricula. This module provides an overview of evaluation concepts and discusses the principles and methods used to evaluate the short-term outcomes of vocational education curricula. The other evaluation module deals with conducting follow-up studies to evaluate the longer-term outcomes of vocational education curricula and with communicating and using evaluation results.

Overview

The first goal of the module is concerned with the role of the curriculum specialist in evaluating vocational education curricula. An attempt is made to define "evaluation" and to describe three general approaches to evaluation that have been applied to vocational education. The Comprehensive Program Evaluation Approach is introduced as the framework for this module's approach to vocational education curriculum evaluation.

The module emphasizes a few specific areas involved in curriculum evaluation, since it is beyond its scope to provide thorough preparation in comprehensive program evaluation skills. The importance of assessing the plan-

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ning and development of the curriculum, the way it is being used, and the outcomes it produces are briefly discussed.

The remainder of the module concentrates on evaluating the short-term outcomes of vocational education curricula. Two phases of evaluation are discussed in Goals 2 and 3 respectively: the pre-implementation and implementation phases.

Prior to performing any evaluation, several analyses should be performed to determine the worth and measurability of the intended curriculum outcomes and to determine the relationship between the intended outcomes and the proposed activities of the curriculum. When these analyses produce satisfactory, affirmative results, attention must be directed to pre-implementation evaluation activities or tryouts.

The importance of and need for tryout activities is emphasized in the module, and a general strategy for their conduct is outlined. Guidelines for developing measures of process and of intended and unintended outcomes are presented along with suggested evaluation designs and sampling strategies. Simple data processing and analysis techniques are mentioned.

The third goal provides greater detail on evaluation methodology in the context of evaluating vocational education curricula after they have been implemented. Likely questions to be answered by such an evaluation are posed. Details are presented on planning the evaluation, developing measures, selecting a design and sample, conducting the evaluation, and processing and analyzing the data. Special attention is paid to five criteria of adequacy that must be considered when developing measures.

Instructions to the Learner

The Self-Check items and possible responses to them are found in the appendices. These questions have two purposes. First, before you begin work on the module, you may use them to check quickly whether you have already learned the information in previous classes or readings. In some instances, with the consent of your instructor, you might decide to skip a whole module or parts of one. The second purpose of the Self-Check is to help you review the content of modules you have studied in order to assess

whether you have achieved the module's goals and objectives.

You can also use the list of goals and objectives that follows to determine whether the module content is new to you and requires in-depth study, or whether the module can serve as a brief review before you continue to the next module.

Goals and Objectives

Goal 1: Define the role of the curriculum specialist in evaluating vocational education.

Objective 1.1: Summarize three approaches to vocational education evaluation.

Objective 1.2: Delineate the curriculum specialist's role in vocational education evaluation.

Objective 1.3: Describe three essential areas in the evaluation of a vocational education curriculum.

Goal 2: Describe the purposes and major activities involved in evaluating a vocational education curriculum prior to its implementation.

Objective 2.1: Describe three activities that should be performed as preliminary steps in evaluating a vocational education curriculum.

Objective 2.2: State the main purpose of conducting preliminary tryouts (pilot tests) of a vocational education curriculum and list the five steps involved.

Objective 2.3: Identify two basic measurement approaches likely to be used in an evaluation and at least two types of tests used in each approach.

Objective 2.4: Describe the evaluation design and sample size most appropriate for use in a pre-implementation evaluation.

Objective 2.5: List appropriate methods for processing and analyzing evaluation data and possible uses for the data.

Goal 3: Describe the purposes and major activities involved in evaluating a vocational education curriculum after it has been implemented.

Objective 3.1: State the purposes of conducting an evaluation after the curriculum has been implemented and list the five steps involved.

Objective 3.2: Identify the characteristics of good measurement techniques.

Objective 3.3: Describe the evaluation design and sample size most appropriate for use in an implementation evaluation.

Objective 3.4: List appropriate methods for processing and analyzing evaluation data.

Resources

In order to complete the learning activities in this module, you will need information contained in the following publications:

Finch, C. R., & Crunkilton, J. R. Curriculum development in vocational and technical education: Planning, content, and implementation. Boston: Allyn and Bacon, 1979.

Wentling, T. L. Evaluating occupational education and training programs. Boston: Allyn and Bacon, 1980.

GOAL 1: Define the role of the curriculum specialist in evaluating vocational education.

Defining Evaluation

Abramson (1979), in a review of the literature concerned with the definition of evaluation, concluded that "a consensus definition" for this field of endeavor does not exist. The various types of definitions he identified were: (1) measurement; (2) congruence between performance and objectives; (3) professional judgment; (4) description; and (5) provision of information for decisionmaking. Evaluation was also distinguished from evaluative research, which is a more "scientific" process aimed at proving rather than valuing.

The "valuing" concept provides a clue to the difference between two major current definitions of evaluation discussed by Wentling (1979), the first being the provision of information for judging decision alternatives, and the second being the determination of worth. According to Abramson, the first definition stresses collecting data to present to decision makers, and the second requires that value judgments accompany the data.

Because evaluation means different things to different people, it is necessary to define the type of evaluation that will be the focus of this module. The initial step in this defining process is to describe three evaluation approaches that have been applied to vocational education.

Evaluating Vocational Education

The purposes and procedures of evaluation activities that have been applied to vocational education can be grouped into three general approaches that will be discussed below. While a particular evaluation probably cannot be neatly categorized as one approach or another, the following classification scheme can serve to characterize it or, at least, some of its elements.

Accreditation approach. The accreditation concept has been around since the 1800s, when it was introduced as a means of

regulating the quality of education offered in the professions, mainly medicine. Today many organizations, including regional and professional associations, state agencies, and single purpose groups, conduct activities called accreditation. An entire educational institution or a single educational program may be accredited. Typically, the process is described as being voluntary, but it may, in fact, be mandatory. Usually accreditation must be renewed periodically; often this is every five to ten years.

The accreditation process is usually characterized by two phases, the self-study and the site visit. During the self-study phase an institution or program examines its offerings in light of general criteria, identifying strengths and weaknesses. A team of experts then examines the self-study report and visits the institution or program to form opinions about its quality. If this peer review finds that the institution or program meets minimum standards and appears to be meeting its own goals, then accreditation is granted.

The accreditation approach to evaluation will not be discussed further, although many of the techniques for data collection, analysis, and reporting presented later in this module and in the following one are appropriate for self-studies conducted by vocational education institutions or programs.

Accountability approach. Funding agencies at all levels are demanding evidence that money used for vocational education is wisely spent for intended purposes. The defining feature of the accountability approach to evaluation is its attempt to provide this information, usually in the form of aggregated data on students served, jobs attained, starting salaries, cost of instruction, and the like.

Requirements associated with federal funds for vocational education have stimulated activity in the data collecting and reporting aspects of accountability evaluation. Federal data needs stem from three aspects of the federal role in vocational education evaluation: establishing a need, ensuring funds are spent as intended, and urging program improvement and redirection (Datta, 1979). The Vocational Education Act of 1963 and its 1968 amendments prompted many states to improve reporting practices, which resulted in a ripple effect that posed additional requirements at the local level. However, this activity was not sufficient to overcome problems with national vocational education data stemming mainly from a lack of uniform definitions (Grasso, 1979, U.S. Department of Labor, 1978).

The federal-state vocational education data system (VEDS) called for in Title II (Vocational Education) of the Education Amendments of 1976 is an attempt to obtain reliable, accurate, and comparable data on vocational education students, programs, graduates and dropouts, staff, facilities, and expenditures (NCES, 1979). Implementation of a system such as this calls for a new round of state and local reporting requirements.

Accountability reporting forms are accompanied by instructions; both forms and instructions vary from state to state and change from year to year. When faced with unclear accountability requirements, reasonable advice would be to seek technical assistance.

Comprehensive program evaluation approach. The literature on educational evaluation contains numerous models that can help structure the evaluation of a total vocational education program. Abramson (1979) contains a nicely organized review of them organized into the categories of decision-oriented models, judgment-oriented models, and other models.

The CIPP model (Context, Input, Process, Product) is prominent in the educational evaluation literature because of its breadth and decision orientation. In theory, the model structures evaluation decisions along two dimensions (ends vs. means and intentions vs. actualities) which results in four types of evaluation. These are:

- context evaluation to assist planning decisions about intended ends;
- input evaluation to assist structuring decisions about intended means;
- process evaluation to assist implementing decisions about actual means; and
- product evaluation to assist recycling decisions about actual ends (Abramson, 1979).

Wentling (1979) has translated some of the concepts of process and product evaluation into a system for program evaluation, which, with minor modifications, can also be applied to the evaluation of courses or segments of instruction. Wentling's evaluation model focuses on eight areas of concern:

- administrative or management organization;
- personnel;
- objectives;
- evaluation system;
- content;
- learners being served;
- utilization of resources; and
- guidance, personnel counseling, placement, and other ancillary services of the program.

Staff or personnel evaluation is an activity that has received minimal attention in education, although it is widespread in those businesses and industries concerned with increased efficiency, production, and profit. Staff evaluation in vocational education, if it is conducted at all, is typically limited to first-year or nontenured teachers, and commonly excludes the many individuals other than instructors who contribute to the quality of education.

In addition to the evaluation concerns mentioned above, a comprehensive program evaluation must consider the cost of the program in relation to the short- and long-term benefits it produces, the program's efficiency in producing benefits, and any unanticipated and perhaps unwanted effects that accompany the benefits of the program.

Requirements included in the 1976 Education Amendments move the evaluation of vocational education programs from models into practice. Along with the VEDS reporting requirements discussed earlier, states must submit planning and accountability reports covering the following topics:

- Planning and operational processes including:
  - (1) quality and availability of instructional offerings,
  - (2) guidance, counseling, placement, and follow-up services,
  - (3) capacity and condition of facilities and equipment,

(4) employer participation in cooperative vocational programs,

(5) teacher/pupil ratios, and

(6) teacher qualifications;

- Results of student achievement as measured by standard occupational proficiency measures or other methods;
- Results of student employment success, such as wages, employment and unemployment, and employer satisfaction; and
- Results of additional services, including service to special populations.

Finally, the states' annual application for continued funding will describe the vocational education needs of potential students and indicate how and to what extent the program proposed will meet these needs and describe how the findings of any evaluations of programs have been used to develop the proposed program (Grasso, 1979). These federal evaluation requirements have stimulated the development of statewide vocational education evaluation systems.

The Role of the Curriculum Specialist

It is not the purpose of this module to train evaluation specialists to conduct comprehensive program evaluations in vocational education. This goal is clearly beyond the scope of even an extensive series of modules. Preparation of a competent evaluation specialist requires graduate level coursework, perhaps an advanced degree, and a substantial amount of experience in actually conducting program evaluations. Short of this, an evaluation coordinator must rely on consultations with experts to fill in holes in his or her background and experience if the evaluation of a vocational education program is to be done as proposed by the model builders and as implied in federal requirements.

Program evaluation responsibilities may fall on an individual curriculum specialist as part of the duties of his or her unique employment situation. However, the curriculum specialist role itself does not require all the competencies of a program evaluation specialist. The curriculum specialist's major concern in the area of evaluation is to collect data and to make decisions for the purpose of improving or judging the worth of his or her product. In this sense, the product of a

curriculum specialist is, of course, the curriculum he or she has developed.

Vocational Education Curriculum Evaluation

The curriculum specialist should consider his or her purpose in conducting an evaluation to arrive at an appropriate focus for his or her evaluation activities. As stated above, this purpose is to improve the curriculum or judge its worth. To accomplish this purpose, it is necessary to examine three closely interrelated areas: the planning and development of the curriculum, the way it is being used, and the outcomes it produces.

Assessing curriculum planning and development. In assessing curriculum planning and development, the curriculum specialist examines the steps used to:

- decide that the curriculum being evaluated was actually needed;
- determine its content, goals, and objectives; and
- select learning strategies and materials.

In short, he or she assesses the rationale for the curriculum and its content and structure in order to validate his or her product.

The modules in this series that present instruction in curriculum planning and development can provide a framework for deriving appropriate questions for assessing curriculum planning and development. This area of vocational education curriculum evaluation is significant, if often overlooked. If the initial phases of curriculum development are not well done, the resulting product is not likely to be worthwhile. If this is the case, improving the planning and structuring of the curriculum is the most basic step in enhancing its worth.

Assessing curriculum implementation. Assessing the implementation of the curriculum is the second area of curriculum evaluation with which the curriculum specialist must be concerned. The ultimate criterion in the evaluation of curriculum must be the outcomes that the curriculum produces in the students who experience it. However, before outcomes can be assessed, it is necessary to determine that the curriculum is being used as was intended. If this is not the case, the curriculum specialist should not proceed to an outcome evaluation,

but rather concentrate on solving implementation problems, either by revising the curriculum or by assisting teachers to use it as planned.

Assessing the outcomes of a curriculum. The assessment of the outcomes of a curriculum is the primary focus of the remainder of this module, although the other two evaluation areas with which a curriculum specialist should be concerned will be mentioned. The module concentrates on evaluating curriculum outcomes because this is the area in which vocational education evaluation is most different from evaluation in other areas of education. The difference arises because the outcomes of vocational education can be more clearly defined. In general, the outcomes of a vocational education curriculum are students who possess the job skills necessary to obtain and advance in an occupation, and who meet the needs of employers. The assessment of student learning and the attribution of that learning to the curriculum will be the topic of the remainder of this module. This represents an evaluation of the short-term outcomes of a curriculum. Assessing the longer-range outcomes of the curriculum through follow-up studies with students and employers will be the focus of the other evaluation module in this series.

Individual Study Activities

1. Read Chapters 1 and 2, pages 2-67 in Wentling, T. L. Evaluating occupational education and training programs. Boston: Allyn and Bacon, 1980. Read pages 246-263 of Chapter 11 in Finch, C. R., and Crunkilton, J. R., Curriculum development in vocational and technical education Boston: Allyn and Bacon, 1980.

2. In a sentence or two, state the purpose of each of the three approaches to vocational education evaluation that are discussed in this module.

3. Write a paragraph that explains why a curriculum specialist should conduct an evaluation of a curriculum he or she has developed.

4. Below is a series of questions that could be asked during an evaluation of a vocational education curriculum. On the line in front of each, write:

   "1" if the question is appropriate to an assessment of curriulum planning and development;

   "2" if the question is appropriate to assessing curriculum implementation; and

   "3" if the question is appropriate to assessing the outcomes of a curriculum.

   ____ a. Do employers think students who experienced the curriculum possess the skills necessary to perform work tasks adequately?

   ____ b. Was the film demonstrating proper work procedures available on schedule?

   ____ c. Are the objectives of the curriculum based on an adequate job description?

   ____ d. Is the curriculum based on an accurate forecast of population and labor market needs?

   ____ e. Were the students' scores on the performance test up to required standards after they completed the curriculum?

   ____ f. Do students think the curriculum included preparation in the skills they need on the job?

___ g. Are students receiving the recommended amount of instruction in the first segment of the curriculum?

___ h. Why was the unit shop approach used to organize this curriculum?

___ i. Were the objectives of the curriculum appropriate to the entry-level jobs students were able to obtain?

___ j. Are the instructional strategies recommended for use appropriate to the students who experience this curriculum?

Discussion Questions

1. Discuss the various definitions of evaluation mentioned in the module and readings, and come up with a definition that is appropriate to the curriculum specialist's purpose of improving and judging the worth of curriculum.

2. Describe examples of vocational education evaluations drawn from class members' experience and discuss which approach or approaches to evaluation each example illustrates.

3. Discuss the effect of federal vocational education evaluation requirements on the development of evaluation strategies, procedures, and techniques.

4. Is it possible to do a "comprehensive program evaluation"?

5. How is an evaluation conducted to improve a curriculum different from one conducted for the purpose of judging the worth of a curriculum?

6. Discuss the interrelationship between the three areas of vocational education curriculum evaluation: assessing curriculum planning and development; assessing curriculum implementation; and assessing the outcomes of a curriculum.

Group Activity

Collect at least three instruments such as tests, questionnaires, checklists, etc. that have been used in vocational education evaluations. Consider in which evaluation approach(es) (accreditation, accountability, or comprehensive) each might be used. Consider whether each might be appropriate for use in a

vocational education curriculum evaluation. If this is the case, consider for which area of vocational education curriculum evaluation (assessing curriculum planning and development, assessing curriculum implementation, or assessing the outcomes of a curriculum) each instrument might be used. Examine each item on each instrument. For what types of decisions might each item supply information?

GOAL 2: Describe the purposes and major activities involved in evaluating a vocational education curriculum prior to its implementation.

Evaluating Curriculum Before Implementation

This module will now address the concepts and procedures involved in evaluating the short-term outcomes of vocational education curricula. Two primary phases of evaluation will be discussed: the pre-implementation and the implementation phases. Pre-implementation evaluation activities are normally carried out during the conceptualization and early development of a curriculum, before it is ready to be used with its intended audience. Their purpose, obviously, is to help improve the ultimate curriculum.

Implementation evaluation activities, on the other hand, are applied to the operational curriculum, after it has undergone at least a minimum of trial and revision at the pre-implementation phase. Their purpose is to assess the effectiveness of the curriculum in attaining intended outcomes and to facilitate decisions regarding the future of the curriculum itself.

There is no simple rule dictating when the implementation evaluation should begin; in general, however, it should not precede a demonstration that the curriculum is capable of producing its desired outcomes for its intended audience.

Analyzing the Curriculum Before Evaluating

Before even beginning pre-implementation evaluation activities, it is important to analyze several aspects of the curriculum as they relate to achieving desired outcomes.

Review intended curriculum outcomes. If the objectives of a curriculum are not worth attaining, it is trivial to measure how well they are attained. Therefore, it is desirable to review the outcomes that are supposed to result from implementing the curriculum. Questions such as the following should be asked:

- Is there reason to believe that the outcomes are important and not already accomplished by the intended audience (i.e., is there a need for the product)?

- Are the desired outcomes described specifically enough to be observed and measured (i.e., can their attainment be measured)?

- Are the desired outcomes feasible in light of the circumstances and appropriate for the intended audience (i.e., is it reasonable to expect the outcomes to be attained)?

If the answers to any of these questions appear to be negative, immediate revisions in the desired outcomes should be sought.

Review logic linking proposed activities to desired outcomes. Regardless of the nature of the vocational education curriculum, it will contain a set of activities to be performed by an intended audience. These could include lectures or demonstrations, slide or video sequences, field experiences, simulations and laboratory experiences, and so forth. It is worthwhile, at this preliminary point, to review logically the rationale that links the proposed activities to the desired outcomes. In so doing, the following questions might be asked:

- Do the activities relate to the desired outcomes (i.e., if the activities are implemented as planned, is there a reasonable chance they will produce the desired outcomes)?

- Are the activities appropriate for the circumstances and constraints likely to exist and for the intended audience (i.e., are the activities practical)?

- Are the activities likely to produce unintended outcomes that will affect the overall impact of the curriculum (i.e., are there likely to be mitigating side effects)?

- Are the activities likely to be cost-effective (i.e., will they be worth their cost in time, money, and effort)?

As with the analysis of intended outcomes, if the answer to any of these questions is negative, revisions should be made and problems resolved before proceeding.

Divide curriculum into components, if necessary. If a curriculum involves several different types of activities (for example, an individualized vocational training module, a laboratory experience, and a simulation situation), it is wise to divide them up and try them out separately. This also requires identifying and reviewing desired outcomes for each component, and analyzing the link between the activities of each component and the outcomes.

Reanalyze logic of curriculum prior to conducting the implementation. A logical analysis of the curriculum, similar to that recommended prior to implementation, is the first step in evaluating the ultimate impact of the curriculum. Some of the questions asked earlier, as well as somewhat broader questions such as the following should be posed:

- Are the needs the curriculum is designed to meet important?
- Are the needs defined in terms of required changes in the way people think, feel, or act?
- Do the desired outcomes of the curriculum relate to the needs it was designed to fill? Is there a reasonable chance that if the outcomes are attained, the needs will be met?
- Are the desired outcomes of the curriculum appropriate for its intended audience and circumstances of use?
- Are the activities likely to produce the desired outcomes under the intended circumstances of use?
- Are the activities implementable within practical time and resource constraints?
- Are there likely to be no unintended side effects, particularly undesirable ones?
- Are the effects of the curriculum measurable in the short run? If not, can other suitable measures be developed?

If the pre-implementation evaluation was done properly, the above questions will likely be answered "yes," and a full-scale evaluation can begin. Negative answers, at this point in time, require clarification at the very least and possibly more substantial curriculum revisions before proceeding.

Pre-implementation Evaluation

As previously stated, it is desirable to subject early versions of a vocational education curriculum to empirical tryouts, or pilot tests. Such tryouts should represent an attempt to use the curriculum (or its components) on a small scale under controlled circumstances in order to gain as much information as possible to guide subsequent revisions. These tryouts should be able to yield data that permit immediate revisions to facilitate larger-scale implementation of the curriculum.

Pilot testing does require resources (time, money, personnel) that might well be devoted to other tasks. Resource limitations might also prevent making the recommended revisions. If resources are thus limited, it may be necessary to implement the curriculum without the benefits of tryouts. It is important to note, however, that the quality of a curriculum can almost always be improved by devoting even minimal resources to preliminary tryouts. The omission of these activities entirely from any curriculum development effort is unwise.

There are, however, occasions when tryouts are not needed. If an activity is a one-shot event that will not be repeated, there would be little need for a tryout. An example of this might be use of a regularly-scheduled TV program on new paraprofessional occupations in the allied health fields, in which the program was available for viewing only once.

Similarly, activities already in their final form for which there is no intent to review should not be pilot tested. These normally would include traditional activities whose content depends on precedent rather than on intent to produce defined outcomes. An example of this might be an orientation for an incoming electronics training class.

It is often impossible or impractical to conduct tryouts on every component of a curriculum since resources are invariably limited. Activities that should get top priority are those most crucial to the success of the entire vocational education curriculum and about which there is the most uncertainty in terms of achieving desired outcomes.

In deciding whether to pilot test, it might be useful to rate the activities selected for implementation on the four scales shown in the figure that follows.

REPLICABILITY

1	2	3
There is no intent to repeat this activity.		If this activity proves successful, it will be used repeatedly in the future.

REVISABILITY

1	2	3
The structure of this activity does not require further improvements.		There is a strong desire to modify and improve this activity.

IMPORTANCE

1	2	3
The success of this activity is not crucial to the success of the vocational curriculum.		The success of this activity is absolutely essential to the success of the vocational curriculum.

UNCERTAINTY

1	2	3
There is no question about the potential effects of this activity.		There is considerable doubt about the potential effects of this activity.

Sum the ratings and rank order the sums. Activities that score highest should receive whatever time and financial resources are available for pilot testing.

The most important information to be gained from pilot testing is whether the curriculum components selected are capable of producing the desired outcomes in its intended audience. Acquiring this information through empirical tryouts involves several sequential activities: (1) planning the tryouts;

(2) developing outcome measures; (3) selecting an evaluation design and sample; (4) conducting the tryouts; and (5) processing and analyzing the results.

Planning the tryouts. Outlining a general strategy and detailing the tasks involved and time required are good first steps in conducting tryouts. Normally, early tryouts should be low cost, involving few students and brief time schedules; these limitations, of course, are relative to the scale of the tasks to be performed. The general strategy is to conduct the tryouts under well-controlled circumstances, using members of the target population, collecting objective information on degree of attainment of intended outcomes as well as any other information likely to be helpful in improving the curriculum. It is important to avoid collecting too much data at this stage, since the scope of revisions will probably be limited, and since data processing and analysis will have to facilitate immediate feedback.

The focus of the tryout is to obtain data regarding the attainment of student outcomes. However, it is also desirable to plan to obtain information on the degree to which the planned activities are being carried out as intended so that any necessary refinements in the process of teaching can be made, and so that ultimately the outcomes can be attributed to proper implementation of the curriculum.

In addition, plans for gathering data on unanticipated side effects, both positive and negative, should be made so that the positive ones can be enhanced and the negative ones lessened. Take this hypothetical example:

> Pretest-posttest tryout data on the knowledge of concepts taught by a film on innovative techniques in computer programming showed a sizeable increase in knowledge among 90% of those tested. The evaluators were pleased and decided to use the film with no revisions until one female participant remarked that the film's sexist language offended her. Subsequent review of her claim led to substantial script revisions. Without her chance remark, the film might well have produced negative side effects in about half of its intended audience.

Developing process and outcome measures. Outcome measures are developed to provide a quantitative description of the extent to which an educational outcome has been obtained. Process measures are developed to describe how an educational outcome has or has not been obtained. Much has been written on

these subjects, but it is not the intent of this module to provide a course in educational measurement. A few basic concepts and techniques, however, will help assure credible measures in both this tryout phase and the later implementation phase.

Measurement techniques will differ according to the type and specificity of the objectives to which they apply. For example, process objectives are usually so direct and precise that measuring their attainment may involve a simple checklist approach such as "Yes, it was done," "No, it wasn't" items.

Example:

	Check one	
The instructor demonstrated proper and improper safety procedures in the use of a table saw.	Yes	No

Similarly, a student performance objective that calls for the carpentry student to identify three types and uses of power saws would involve a fairly straightforward questioning approach. On the other hand, an objective requiring the sales student to establish good rapport with a customer would be more difficult to measure. That some outcomes are easier to measure than others does not mean that trivial, easier-to-measure objectives should be substituted for more important, harder-to-measure outcomes. If an outcome describes something someone can do, say, think, or feel, it is measurable.

Although there are numerous measurement techniques available, mastery of a few basic techniques will allow the evaluation of most vocational education outcomes at both the tryout and implementation stages. Two basic categories are applicable:

- Written tests (paper-and-pencil instruments). These include true-false, multiple-choice, completion, and similar objectively scored test questions; essays; checklists; rating scales; and questionnaires. Generally, these pose fixed questions and require a written response. They are easy to administer and score and can easily measure both knowledge and attitudinal objectives.

- Performance tests. Performance tests are vitally important in vocational education. Such tests pose a fixed question or situation and require the student to do and/or

produce something. The response is observed and scored according to predetermined standards. In vocational education, performance tests take two forms: (1) the performance test requiring the student to accomplish a job-like task under controlled and observed conditions, and (2) the product evaluation wherein the product resulting from the performance is evaluated. (The latter, in contrast to the former, does not allow for determining whether the correct process was performed.) Further information on types of tests and their applications in vocational education evaluation may be found in the module in this series that deals with the selection of instructional strategies and the assessment of student achievement.

Since small-scale tryouts are likely to employ measures of outcomes constructed by the evaluator, it is crucial for him or her to be aware of and to apply conscientiously certain well-accepted considerations that help to ensure adequacy of measurement. These considerations are listed below, and will be discussed in detail later.

- Objectivity. Will the technique yield the same score regardless of who is applying it?
- Reliability. Does the technique produce data that are free from random error and thus yield a relatively constant score?
- Validity. Does the technique measure what it is supposed to be measuring?
- Efficiency. Is the technique relatively cheap and easy to administer? (This is especially important during tryouts.)
- Non-reactivity. Does the technique unduly influence the subsequent behavior of the respondent?

Selecting a sample and an evaluation design. In conducting tryouts, the curriculum specialist is most interested in inferring from the results the likely outcomes of larger-scale implementation, and in making revisions to improve attainment of outcomes. Thus, it is necessary to select persons for the tryout who are at least broadly representative of the intended audience. In practice, this often means identifying five or six persons who are likely to do very well, very poorly, and average on the activity. Strict random sampling procedures (wherein each student has an equal chance of being selected) are rarely used because small random samples are not likely to be broadly representative of the audience.

The term "evaluation design" refers to the arrangement of persons, an activity, and outcome measures used so that inferences can be made about the probable effects of the activity on a larger group of similar persons. Although design considerations arise more often and are more complex in conjunction with evaluation after implementation, a word on design for tryouts is in order.

The design recommended for most tryout applications is the "one group pretest-posttest design." In this method, outcome data are gathered both before and after the curriculum has been tried out. In using this design, it is especially important that the measures used do not in themselves unduly influence the subsequent performance of the persons tested. With appropriate measures, this design will provide information on the degree to which students can already perform the desired outcomes, and the gain in performance that is probably due to the curriculum. Sometimes, limited resources or circumstances may prevent administration of a pretest, and a posttest-only design will suffice. The expenses associated with using a control group preclude this type of design for a tryout.

As a reminder, it is important at this stage also to collect process data regarding implementation of the curriculum, so that problems in materials and procedures can be resolved as quickly as possible. Similarly, it is important to be on the lookout for unintended outcomes so that revisions resulting from such outcomes can be made.

Finally, care should be taken to ensure that student outcomes can be related to that student's pretest data and to any personal traits (e.g., sex, ability level, motivation) that may have affected the outcomes. Observations in this area can help predict whether there will be differential performance effects during large-scale implementation.

Conducting the tryouts. A number of fairly straightforward tasks are involved in actually collecting the tryout data. First, the tryouts must be scheduled. The schedule should include, if needed, training for any test administrators, notification of students and instructors involved, and the testing itself.

Second, test administrators must be selected and trained. Depending on the outcome measures used, it may be necessary to exert care in selecting appropriate persons and in orienting or training them. These efforts, however, are likely to be low-key in small-scale tryouts.

Third, the identified students, and possibly staff involved in providing process information, should be notified of the purposes and procedures involved in the tryouts. And finally, the data can be collected according to the plans and procedures outlined.

Processing, analyzing, and using the data. Since the number of persons involved in tryouts is small, the resulting data can be tabulated simply. Analysis of the data should be similarly straightforward. Percentages of items answered correctly or checked in a particular category, or percentages of participants able to perform at specified levels, will normally suffice. Most important, the analysis should not hide the ability of the data to indicate where revisions are needed.

A number of decisions must be made as a result of tryouts. Data are especially useful in helping to support the developmental hypothesis that the curriculum activities are in fact appropriate for the intended audience. For example, if the pretest data show that participants can already perform the intended outcomes, then the need for the activities becomes questionable. If, on the other hand, data indicate that the concepts introduced are totally foreign to the audience, modification of the activities or the intended outcomes might be in order.

Posttest tryout data may show that desired outcomes are substantially beyond the capability of the curriculum to achieve. Such a finding might prompt major revisions or even a reassessment of the need for the curriculum itself. More likely, these data will suggest specific instructional problems in various components of the curriculum. Then attention can be directed to remedying such problems prior to large-scale usage. Sometimes further tryouts may be needed to refine the curriculum further before full implementation.

Individual Study Activities

1. Categorize each of the following evaluation activities according to whether its intent is to collect process (P) or outcome (O) data. Indicate P or O in the space preceding the activity.

   ____ a. Determine whether appropriate books and materials are being used by students in a home economics class.

   ____ b. Observe student demonstrating proper woodworking techniques.

   ____ c. Evaluate the quality of a simple program developed by a computer programming student.

   ____ d. Interview a nursing student to determine which parts of a course were most helpful in teaching intravenous techniques and applications.

   ____ e. Administer a multiple-choice test on sales strategies to a retailing class.

   ____ f. Determine whether drafting teachers are following a prepared plan of instruction.

   ____ g. Observe and assess how well a home economics student applies a zipper to a dress.

2. See pp. 80-95 (measures of knowledge) and pp. 95-124 (measures of performance) in Wentling, T. L. Evaluating occupational education and training programs. Boston: Allyn and Bacon, 1980.

3. Select from the list provided on the next page the type of measurement technique the evaluator might best use to obtain answers to the following questions, and indicate it in the space preceding each question.

Measurement techniques:

1. Written tests (e.g., multiple-choice, true-false)
2. Product evaluation
3. Performance test
4. Checklist
5. Questionnaire

____ a. Is the student able to remove and replace nuts and bolts with an air wrench properly?

____ b. As a result of the industrial arts program, will students have an improved attitude toward good craftsmanship?

____ c. Will the nursing students understand the physiological reasons and treatment for chronic hepatitis?

____ d. Will the business students be able to identify the qualities of a good employee?

____ e. Are all personnel involved in the forestry program satisfied with the way it is being conducted?

____ f. Are all prescribed equipment and materials for a course in bench metalwork available to students?

____ g. Are the buttonholes and fasteners on a tailored coat applied properly?

____ h. Is the program in video electronics being implemented as planned?

____ i. Is the student able to obtain an accurate reading of a patient's blood pressure using correct procedures?

____ j. Is the business letter typed in accordance with standards described in the course manual?

Discussion Questions

1. a. What are some examples of everyday evaluations we all make? What criteria do we consider in making these evaluations? Why are everyday evaluations made?

   b. What are some common, everyday evaluations that a vocational teacher might make? What criteria might be considered, and how are these criteria unique to vocational education? Why might these evaluations be conducted?

2. Discuss under what conditions it is or is not appropriate to conduct pre-implementation evaluation activities. What constraints might limit activities in this area? Try to relate your discussion to examples from your own setting.

3. What is the difference (are the differences) between assessing processes and outcomes in the pre-implementation phase of evaluation? Why is it important to assess both?

4. An electronics technician instructor has developed some new exercises to improve the manual dexterity level of students. The department head is thinking about using these exercises throughout the department. What should be done to try out these exercises prior to implementing them department-wide? Consider such things as when to try them out, with whom, under what conditions; likely ways to process, analyze, and use results; etc.

Group Activities

1. The purpose of this activity is to provide practice in analyzing a vocational education curriculum in terms of its defined student outcomes and the relationship between the outcomes and the proposed activities.

   Part of a new woodworking curriculum is presented in the figure on the next two pages. Assume that the curriculum is adequately budgeted and that it is to be used with new, inexperienced woodworking students. In your group, analyze the curriculum. Use the questions outlined in the section on "Analyzing the Curriculum Before Evaluating" (Goal 2 of this module) as your discussion guide.

Figure 1

Woodworking Curriculum

Student Outcomes	Proposed Activities
1. State the importance of the woodworking industry.	1. Invite students to present reports on some aspect of the woodworking industry. 2. Visit several woodworking industries. 3. Have panel discussion about "Contributions of the woodworking industry to home and family."
2. Develop good work habits.	1. List specific standards for each job. Discuss. 2. Discuss importance of good habits vis-a-vis industrial practices, job advancement, and so forth. 3. Provide a clean, organized workshop conducive to good learning. 4. Provide means for students to plan their work methodically and accurately. 5. Measure students' work objectively.
3. Develop an understanding of labor and management.	1. Give reading assignments in trade magazines. 2. Arrange for visits by persons in industry representing both management and labor. 3. Have discussions on problems relating to labor unions, responsibilities of management, and personnel relations. 4. Have suggestion box for ideas about running a wood shop.
4. Develop an appreciation of good craftsmanship.	1. Arrange field trips through at least two factories, one that produces cheap furniture and one that produces fine furniture. 2. Have students analyze products for good and poor construction, design, etc. 3. Discuss principles of good design and good workmanship. 4. Hold a contest to display projects of good craftsmanship and design.

2. Read each of the following situations. Discuss each one in terms of the "lesson" it teaches regarding desirable pre-implementation evaluation strategies. In other words, what might you do differently in a similar situation to improve the evaluation effort?

a. In May, a team of developers at ADS, Inc. was given a contract to prepare an innovative curriculum in advertising and sales for the Fountainville Community College District, on the understanding that the developers would be able to deliver the following March. The team members got to work at once, but since summer was over by the time they finished the materials and developed the accompanying book and AV materials, the team had everything produced and began a full field test in August without bothering to try the components out first. When results were finally in, the field test revealed a number of serious problems. The revisions required were so extensive that the materials could not be completed by the deadline, and it was therefore the following autumn before the program could actually be implemented in the community colleges.

b. Another team at ADS, Inc. had developed a business training program with a short film illustrating several types of employee-employer interactions. The team had carefully prepared a pre-posttest to measure learning, and the film was shown to a small number of persons from the intended audience. When the tests were administered and scored, the team found that most of the subjects, while performing at about the "chance" level on the pretest, got about two-thirds of the items right on the posttest. They were still discussing the implications of this when one of the team happened to hear a student remark, "You know, that film was a nice idea, but we all thought the narration was a bore."

c. A home economics textbook writer recently explained that he did indeed try out his book before publication. He had several teachers use it in their classrooms for a semester and then report their reactions. When asked what aspects of the book he was interested in evaluating, he replied, "None in particular. I was interested in reactions in general."

d. Stan Binet was monitoring the tryout of a self-instructional booklet intended to help technical education teachers improve their ability to construct tests. Since it was summer vacation, he had been able to find

a group of experienced teachers to use as subjects, and for convenience he had asked them to come to his office and work in a room set aside for that purpose. When the tryout began, Stan found that the teachers spent a lot of time drinking coffee and talking to each other, and their comments on the materials seemed to be a consensus rather than a collection of individual reactions. After he inadvertently mentioned that he had helped write the booklet, the severity of their criticism decreased noticeably.

e. Strategy Simulation Games, Inc. was working on a simulation exercise to improve the safety habits of industrial arts students. The game was tried out with five groups of students of different ability levels, and trained observers noted the behaviors of each student as he or she performed the exercise. The observers accumulated five folders full of new data, in addition to pre- and posttests on safety habit levels. When the tryout was over, the data were delivered to the staff member assigned to review the exercise. She spent a month analyzing and introspecting about the data and produced a 79-page pilot test report. The report arrived in the Strategy Simulation Games, Inc. offices too late for the exercise to be incorporated in the industrial arts curriculum for which it was designed.

These situations were presented to illustrate some of the general principles and strategies of pre-implementation evaluation stressed in the module. In your group, discuss these principles and derive a general strategy for such an evaluation. Discuss such questions as the following:

- Why is it important to pilot test?
- What should be evaluated?
- What types of activities should be involved?
- What constraints might limit your efforts?
- What controls should be placed on the efforts?

GOAL 3: Describe the purposes and major activities involved in evaluating a vocational education curriculum after it has been implemented.

Evaluating Curriculum After Implementation

Whether or not a curriculum specialist is accountable to some outside authority for the effectiveness of his or her curriculum, potential users need to have some assurance that it works. Thus, an evaluation of the curriculum's performance should be carried out soon after it is implemented on a relatively large scale. Such an evaluation attempts to answer questions like these:

- Can the curriculum be implemented by intended users who are not under the direct control of the developer?
- Is the curriculum successful in producing its desired outcomes? Are these produced with a minimum of undesirable side effects with all members of the intended audience?
- Are desired outcomes produced under a wide array of circumstances and situations (i.e., how generalizable is the evidence of effects)?
- Are desired outcomes produced within acceptable cost limits and likely implementation constraints?
- Are the outcomes stable over time?

Implementation Evaluation Concepts

The concepts and procedures of an implementation evaluation are somewhat more detailed than those already presented for pre-implementation tryouts. But they are basically the same, involving, after the initial logical analysis of the curriculum, the following steps:

- Planning the evaluation
- Developing process and outcome measures
- Selecting a design and sample
- Conducting the tests
- Processing and analyzing the results

Since many of the concepts are so similar to those already discussed, an attempt will be made in the following sections to avoid repetition and to elaborate on aspects unique to this evaluation phase.

Planning the evaluation. There is no one "right" time to conduct the evaluation. The timing depends largely on the purposes of the evaluation. When program personnel need information to make major decisions, an evaluation is in order. However, it is best to wait until the program is well underway before attempting an evaluation.

Obviously, it is necessary to know which program personnel need information and what information is needed. What questions must be answered? Some of the likely questions have just been listed on the preceding page.

In addition, the evaluator must know what resources are available to conduct the evaluation so that practical limitations can be considered in planning. Such resources include money; professional, clerical, and other labor resources available; supplies; computer facilities; and so forth.

Because resources are never unlimited, it will be necessary to select the outcomes to be evaluated. The choice will naturally depend on the decisions that need to be made. An effort should be made to meet these decision needs rather than to focus only on the easy-to-measure outcomes. It is better to have limited data on important outcomes than to have lots of data on trivial ones.

In addition to selecting the outcomes for measurement, possible positive or negative side effects should be identified. Clues may be available from earlier tryout efforts. Also, as in the tryouts, it is important to plan to gather data on process--that is, on the circumstances and activities associated with implementation of the curriculum. Process measures would yield information regarding the following: circumstances of implementation (staff characteristics; physical and demographic

characteristics of the evaluation site; components of curriculum implemented and how; extenuating circumstances; atmosphere; etc.); costs of implementation (staff; equipment and materials; facilities; miscellaneous); and characteristics of the participants (number; demographic traits; motivating conditions).

Collection of such process data fulfills several important functions. It helps to ensure that the curriculum was implemented as intended so that the outcomes measured can legitimately be related to the curriculum. In helping to describe the curriculum implementation adequately, it helps future users to implement it properly. And finally, it provides an empirical basis by which future curriculum developers can predict the effects of specified kinds of instructional activities on specified audiences under specified conditions.

Developing process and outcome measures. The types of measures likely to be used in the evaluation of a vocational education curriculum have already been discussed at some length with regard to tryouts. Similar techniques are used during this phase of evaluation. In addition, the major steps to follow in developing measures are to:

- select the types of instruments needed to measure the outcomes and processes identified;
- draft appropriate measures;
- try out the drafted items on a small group of students similar in characteristics to the target group (a mini-pilot test); and finally
- revise and refine the measures.

In constructing post-implementation evaluation measures, it is particularly important to apply the considerations of adequacy (criteria) listed earlier. It should be mentioned that all measurement techniques have some deficits in all of the following criteria; what is important in designing measures is to maximize the levels of adequacy. Further discussion of how to accomplish this is warranted.

- Objectivity. Objective methods are those that yield similar scores no matter who is doing the scoring. In general, paper-and-pencil tests, checklists, and rating scales are more objective than performance tests and observations. To improve objectivity, it is necessary to establish scoring rules that facilitate clear assignment of scores to each response. For a

less objective test (e.g., an essay), this may require developing a key that gives scoring rules and examples of typical responses and their proper scores. In addition, identifying information should be removed from each response so the scorer will not know whose work it is.

• Reliability. Reliable measures are those that yield constant scores relatively free from chance variation over time. Lack of objectivity as well as trick questions or inaccurate recording devices (e.g., inaccurate test keys, unwound timers) can produce low reliability. To improve reliability, it is important that instructions and testing conditions be the same for all persons; that practice, or sample items, be given if possible to avoid effects from unfamiliarity with the type of measure being used; and that several measures for the same objective be used rather than one.

• Validity. Valid measures are those that are closely related to and broadly representative of the outcome being measured. Measurement techniques that are relatively objective and reliable may also be relatively valid. However, additional assurance of a measure's validity should be obtained by constructing a logical rationale for each measure used (to see better its relationship with the desired outcome) and by providing sufficient measures of each important outcome. An axiom of evaluation is that if several independent measures of the same outcome produce highly similar results, the measures are likely to be acceptably valid.

• Efficiency. Efficient measures are those that yield reliable and valid scores at a low cost in terms of money, personnel, and time. In general, this means that the measures can be administered to groups, on a single occasion, and under normal rather than contrived circumstances (e.g., an ordinary classroom setting). Measures that can be scored and processed quickly and easily (e.g., by a clerk or machine with a simple key) are more efficient than those requiring more time and expertise (e.g., analyzing the quality of a dental bridge).

• Non-reactivity. A non-reactive measure is one that does not unduly influence the behavior of the person to whom it is being applied. The classic example of a highly reactive measure is uprooting a seedling daily to measure its growth. Relatively non-reactive measures include routinely collected records and observations--for example, observations of time to complete an activity and frequency of certain behaviors. Such techniques may not be as relevant to vocational education measurement as to other areas, but it is important to be aware of the level of reactivity and to try to minimize it. A way to promote non-reactivity that is likely to be relevant in the

area of performance testing is to use observers who are familiar to students or to place observers so as not to intrude on the situation being observed.

Selecting an evaluation design and sample. As discussed earlier, an evaluation design is the arrangement of persons, an activity, and measures of outcomes used to facilitate inferences about the likely effects of the activity on a larger group of similar persons. In the context of implementation evaluation, "the persons" are a representative sample of the defined audience; "the activity" is the controlled implementation of the curriculum; "the measures of outcomes" are just that, intended outcome measures; and "the larger group" is the entire defined audience for the curriculum. The desired inferences relate to the five basic evaluation questions outlined at the beginning of this section.

The essential element of a good evaluation design is its ability to support strong inferences, particularly regarding assertions that the curriculum as implemented caused the effects measured, and that the participants are a representative sample of the entire defined audience. The design that will best support strong inferences is one in which two subsamples of participants are randomly selected: one subsample (the experimental group) participates in the curriculum implementation; the other (the control or comparison group) does not. In addition, outcome measures are administered both before (pretest) and after (posttest) the curriculum is implemented. When outcome measures are processed, the performance of the comparison group is used to indicate what the participants' scores would have been without having been exposed to the curriculum.

Unfortunately, it is often not possible to use this randomized pretest-posttest control group design properly. There may not be enough persons available to construct two groups. Available persons might not be truly representative of the intended audience, threatening the generalizability of the results. It may not be possible to collect all the needed data from the non-participants who have no incentive to participate in the evaluation. Under such circumstances, the evaluator might have to compromise. For example, it may be necessary to use a nonrandomly selected group of non-participants, chosen by their willingness to cooperate. In this case, an effort should be made to provide evidence (by comparing the pretest performance of the two groups) that the two groups are not inherently different. Remember, the strength of the inference depends directly on the strength of the evidence provided.

The strength of the inference is also directly related to the number of persons involved in the study. The more participants, the greater the chances of detecting real differences between experimental and comparison groups and the more generalizable the results. However, it is often logistically difficult to involve large samples in both the curriculum implementation and the evaluation. Thus, in general, 25-40 persons per group are probably adequate. The groups should be kept about the same size to strengthen resulting statistics. If a number of persons drop out after the pretest, the pretest scores of the dropouts and non-dropouts should be compared to ensure that no significant factors (e.g., ability level) caused the attrition.

Conducting the evaluation. Procedures for conducting the evaluation are somewhat more detailed than those involved in the tryout phase but are essentially the same: scheduling, identifying and training administrators, identifying and orienting participants, and administering instruments.

A detailed schedule for training administrators, orienting students, and collecting data should be prepared. It is best to collect data in as short a time period as possible to minimize disruption of regular school schedules. Rooms of adequate size and appropriate facilities should be reserved. Schedules should be made available to all participants to facilitate coordination efforts.

Different types of people might serve as test administrators. Regular teachers can probably be used if the evaluation focuses on paper-and-pencil tests. If other types of measures are used, such as performance tests or work samples, it might be preferable to hire outside persons from the relevant vocational area.

Depending on the tasks to be performed, some training of administrators might be needed. Training can employ a combination of approaches including written materials, workshops, and practice exercises.

Participating students may require some orientation to the purposes and procedures involved in the evaluation. Orientation should be uniform for all students and can include both written and orally presented materials. Through orientation, not only is information provided but cooperation is also promoted.

Processing and analyzing the data. The choice of appropriate processing and analysis procedures depends largely on the measures used, the evaluation design, and the resources available.

It is possible that, as in tryouts, much of the data processing will be done manually, especially when samples are small and resources limited. Often, hand-scoring involves making judgments about the adequacy of a response or translating a complex response into a single score. This would be true, for example, in evaluating a work sample (e.g., mitering a table corner; composing an adequate business letter; developing an efficient computer program; repairing a defective automotive part).

Where such judgment is needed, several points should be considered. First, does the scorer understand the criteria and apply them consistently over time? Second, has objectivity been promoted by concealing identifying information from scorers? Third, would two or more scorers assess the same response similarly? To answer these questions, it is desirable to score a random sample of responses twice. If results are inconsistent, it would be good to retrain the scorers and rescore troublesome items.

In many cases, a computer can be very helpful if resources permit. The evaluator's job in this case is to have data recorded onto computer cards or tape and to determine what information the computer should provide and how it should be presented. A computer programmer can then write or select an appropriate program, and the computer will provide the results.

Sometimes using a computer may not be necessary, but less sophisticated automatic data processing (ADP) equipment may be helpful. One of these is a card sorter. Data are keypunched onto cards, and the sorter tabulates the cards numerically or alphabetically. If available, a card sorter can be particularly useful in organizing the data--for example, into specific groups of people, into alphabetical order for ease of locating data, or into consecutive code numbers when identities are concealed. It is, in fact, often important to divide the data into groups according to distinguishing participant or implementation characteristics.

It is important to note that the ease and convenience of computer processing vary with the task. One can experience colossal headaches with computers and ADP when simpler manual procedures would suffice.

The next step is analyzing the processed data. Instruction in sophisticated data analysis is beyond the scope of this module. Rather, simple methods of data presentation will be discussed, and use of more complex analysis techniques will be mentioned briefly.

Descriptive data may be presented in tabular, statistical, or graphic form. An example should help clarify the differences among these methods. Suppose that a performance test was administered to 100 business students as part of an evaluation of a curriculum component focused on 10 office machine skills performance objectives:

- The degree to which students achieved the objectives would be presented in tabular form as in Table A on the following page. It describes the number of objectives achieved by all students.

- These numbers are also transformed into the percentages of students achieving each objective. These percentages are a type of statistical summary of the data. Proportions, ratios, and averages may be used also.

- The bottom of Table A presents the same data in graphic form. Graphs tend to be easier to understand than other modes of presentation.

To facilitate decisions based on the evaluation data, it is often necessary to perform more complex analyses. Evaluation analyses conducted fairly routinely include the following: tests of statistical significance to determine whether differences among groups tested are greater than those that would occur by chance alone; correlation techniques to help indicate whether the curriculum works better (or worse) under certain circumstances or with certain types of persons; estimating reliability of measurement to assess the constancy of the measure used; and statistical gain analysis to determine whether posttest scores are significantly better than pretest scores for a particular group.

As stated earlier, there is neither time nor space here to convey even an elementary understanding of the statistical techniques used in many desired data analyses. At this point, the evaluator will need to gain further knowledge in this area, or employ the help of persons with appropriate expertise.

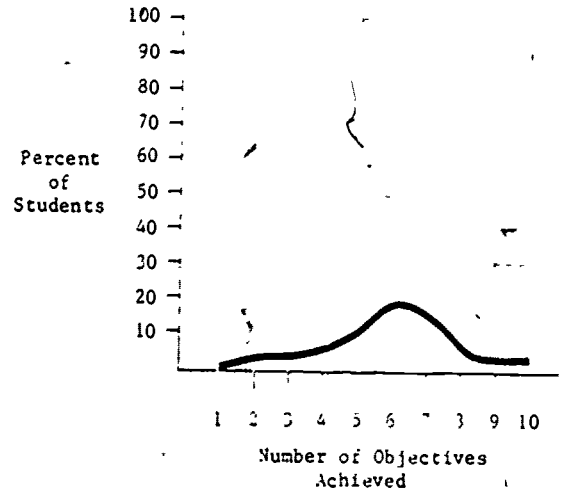
Once the data have been analyzed, they must be reported and utilized. These steps are covered in the module in this series that deals with conducting follow-up studies and communicating evaluation results.

Table A

Number and Percent of Students Achieving Objectives on an Office Machine Skills Test

Number of Objectives Achieved	Number of Students	Percent of Students
1	0	0
2	5	5
3	5	5
4	10	10
5	15	15
6	25	25
7	20	20
8	10	10
9	5	5
10	5	5
Totals:	100	100%

Graphic Representation of the Percent of Students Achieving Objectives on the Office Machine Skills Test



Individual Study Activities

1. Imagine the following situation and discuss what kind of evaluation design could be used to determine:

   - if the curriculum needs changing,
   - which simulator is best, and
   - if a simulator is needed at all.

Three years ago, Ed Ames prepared a curriculum for a large electronics technology associate degree program at a local community college. In talking to the employers of many of the program's graduates, he finds that the employers are not satisfied with the graduates' troubleshooting performance. Since the electronics technology curriculum is heavily loaded with classroom and laboratory troubleshooting experiences with a focus on both principles and applications, Mr. Ames becomes confused and rather concerned. The instructors in the electronics technology program are well qualified and seem to have done a good job in otherwise preparing their students.

The electronics instructors put their heads together and decide that the program lacks a high-quality, easily-programmed trouble-shooting simulator. There are three simulators on the market, one by the Do-All company for $7,000; one by the Do-Some company for $4,300; and one by the Do-Little company for $1,500. The four instructors don't know which of the simulators would be best; the Dean of Vocational Education wonders if the problem is lack of simulator or lack of good instruction.

There are two problems, then:

- which of the simulators is best for the situation (the instructors' problem), and
- is the problem lack of good instruction or lack of a simulator (the dean's problem)? You, as Mr. Ames, are called in to assist the dean and the instructors with their problems. Assume that all three simulators can be obtained on loan from the manufacturers for one year for field test purposes, and assume that twelve classes at the college emphasize troubleshooting.

2. Collect two instruments that have been used in some sort of vocational education evaluation activity in your setting (preferably one written test and one performance test). State how each of the five criteria of adequacy can be met (or improved) in each test.

3. This module deals rather briefly with statistical principles and techniques used in evaluations. If you feel you need more information in this area, read the relevant chapters in Weinberg, G. H., and Schumaker, J. A. Statistics: An intuitive approach (3rd ed.). Belmont, CA: Wadsworth, 1974.

4. Consider the possibility of a curriculum evaluation in your own setting, or of a vocational education curriculum with which you are familiar:

   - What resources are available for evaluation? Consider each step of an evaluation in terms of available money, staff, time, and facilities.

   - What are some specific types of data that might be collected in the evaluation?

   - Locate a person in or associated with your institution who has expertise in data processing and analysis, evaluation, and/or computers. Discuss with that person how you could best process and analyze the kinds of data you listed in the item above to produce meaningful evaluation results.

Discussion Questions

1. Discuss the following statement: It is better to have limited data on important outcomes than extensive data on trivial ones.

2. Why is it important to obtain information regarding how a vocational education curriculum was implemented and whether it produced unintended side effects?

3. Do you agree or disagree? "It is impossible to expect evaluation measures to meet all criteria of adequacy. It is better to have inadequate measures than to have no measures at all."

4. The desirability of randomly assigning students to control and experimental groups was discussed in the module. What problems, if any, might this cause to a vocational education evaluator?

5. What factors should be considered when determining how evaluation data should be processed and analyzed?

Group Activities

1. If possible, get together with one or two other persons from your own institution to plan an implementation evaluation. Using your answers to the last item in Group Activity 1 above (types of decisions you need to make) as a guide, discuss the following questions and write down your evaluation plans.

   - What most needs evaluating? (Focus your plan around this.)
   - What resources (people, time, money) will likely be available to you?
   - Is a design needed for this evaluation? Why or why not? If "yes," what design is best? Will practical constraints make this impossible? What design will you use?
   - What will be the target population, and how will the sample(s) be selected?
   - What objectives will you measure?

   For persons who are not currently working in an appropriate setting, use the following simulation example as a basis for an evaluation plan.

Simulation

Imagine that you are the Director of New Curricula for the Sandhill Community College District, a district made up of four large community colleges. Your district is an unusually well funded one, supported by a fairly homogeneous upper-middle-class constituency that is closely involved with community college matters. Consequently, substantial resources over the past years have been devoted to developing new vocational curricula for which particular community needs were shown to exist. One of the new curricula developed was Travel Careers, a curriculum consisting of a series of seven courses that focus on three major areas: sales

practices, domestic travel and ticketing, and international travel and ticketing. The learning emphasis in all units is on the acquisition of knowledge and practical skills that will directly prepare students to obtain and succeed in jobs in the travel area.

All seven courses have been intensively pilot tested at one of the district's colleges during the last two years with very promising results. Final revisions have been made, and you plan to implement the curriculum on a larger scale at two community colleges next year.

Of course, you will want to know how effective the curriculum will be in meeting its multiple objectives. Although you've had ample funds in the past for curriculum development, your budget for evaluation is more limited. You can, however, count on substantial assistance from the teaching staff and from your advisory panel, which is made up of volunteer professionals from local travel agencies.

Your task is now to design an appropriate curriculum evaluation, considering the variables described above.

Get together with one or two other "Directors of New Curricula" to design an evaluation, using the questions listed above as a guide.

2. The purpose of this activity is to help you develop an understanding of the need for and potential benefit of conducting an implementation evaluation in your own setting.

Break into small discussion groups (three to five persons); if possible, get together with persons who have a similar institutional role (i.e., all vocational directors group together, principals, department chairpersons, teachers, and so on). Then briefly discuss each of the following:

- Major decisions you've made over the last six months to a year and how you arrived at them.
- How the decision-making processes used might have been more effective. (Could you have used more concrete data?)

- Kinds of accountability demands you presently face.
- Types of decisions you need to make and/or questions you want to answer over the next six months to a year.

Keep your discussion in mind as you proceed to the next activity in which you plan your own evaluation.

3. The purpose of this activity is to give you an opportunity to talk to persons in the field who have been involved in evaluation issues. Record your findings and analyze them in terms of the issues raised below.

   Select a nearby high school or community college district, and interview several members of the vocational education staff to determine answers to the following questions:

   - How much of the district's vocational education budget is available and used for evaluation activities?
   - Does the district evaluate the effectiveness of its vocational instruction in terms of immediate student outcomes? If yes, when was it last done? How was it done (design, sample, measurement approaches, data analysis methods, results)?

   Critique your findings in terms of what you have learned in this module (i.e., assess the adequacy of the evaluation methods used; suggest ways in which it might have been better).

   NOTE: Make sure that only one group of students interviews each individual.

Summary

After the goals, objectives, and instructional strategies of a vocational education curriculum have been developed, the curriculum is ready to be implemented. This is also the time to begin determining whether the curriculum is effective in achieving its intended goals and objectives--or outcomes. This process is known as evaluation: the focus of this module. This module covers three main aspects of evaluation:

- The role of the curriculum specialist in evaluating vocational education curricula
- The purposes and activities involved in evaluating curricula prior to their implementation
- The purposes and activities involved in evaluating curricula after they have been implemented

The latter two aspects relate, in this module, to evaluating the short-term outcomes of vocational education curricula.

Three approaches to vocational education evaluation are described: the accreditation approach, the accountability approach, and the comprehensive program evaluation approach. The curriculum specialist's role requires a focused and modified comprehensive program evaluation approach and involves collecting data and making decisions in order to improve the curriculum and judge its worth. To accomplish these tasks, it is necessary to examine the planning and development of the curriculum, the way it is being used, and the outcomes it produces. This examination, or assessment, should ideally take place prior to and after any large-scale implementation of the curriculum.

Pre-implementation evaluation activities, or tryouts, are usually carried out in order to improve the curriculum before it is used on a large scale. Implementation evaluation activities, on the other hand, are conducted after the curriculum has been used more widely in order to assess the effectiveness of the curriculum in attaining its intended outcomes and to facilitate decisions regarding its future.

Prior to conducting any evaluation, it is important to review the intended curriculum outcomes, analyze the logic linking the proposed activities to the outcomes, and, if necessary, divide the curriculum into components for separate analysis. Subsequently, the five steps listed below are performed in either the pre-implementation or implementation phase of evaluation:

- Planning the evaluation
- Developing process and outcome measures
- Selecting an evaluation design and sample(s)
- Conducting the evaluation
- Processing and analyzing the data

Two basic types of measures are likely to be used in vocational education evaluations: written tests and performance tests. They should be designed to adhere as closely as possible to five criteria of adequacy: objectivity, reliability, validity, efficiency, and non-reactivity. The persons tested should be representative of the intended audience, preferably selected randomly for the implementation phase. Resulting data may be processed and analyzed by hand or machine (computer), depending on available resources and evaluation needs. Once the data are analyzed, they must be reported and utilized. This phase of the evaluation is covered in the module in this series devoted to conducting follow-up studies and communicating evaluation results.

APPENDICES

Study Activity Responses

GOAL 1

Individual Study Activity Responses

1. The purpose of the assigned reading was to provide an overview of the various types of vocational education evaluation and to stimulate you to consider the relationship of curriculum evaluation to program evaluation and materials evaluation. The scope of curriculum evaluation is narrower than that of program evaluation, but it includes more than the evaluation of the materials' quality. Curriculum evaluation is concerned with the planning and development of a curriculum, its implementation, and the short- and long-term outcomes it produces.

2. The purpose of the accreditation approach to evaluation is to ensure that educational programs and institutions meet minimum quality standards and achieve their goals. The purpose of the accountability approach to evaluation is to provide evidence that educational funds are wisely spent for intended purposes. The purpose of the comprehensive program evaluation approach is to improve educational programs and to make decisions about their worth.

3. A curriculum specialist should conduct an evaluation of a curriculum he or she has produced in order to identify ways to improve it and to determine whether its outcomes are of sufficient value to justify its continued implementation.

4. 3 a.

   2 b.

   1 c.

   1 d.

   3 e.

   3 f.

   2 g.

   1 h.

3 i.

1 j.

Discussion Question Responses

1. The discussion should include evaluation defined as:

   - measurement;
   - congruence between performance and objectives;
   - professional judgment;
   - description; and
   - provision of information for decision-making.

   The distinction between evaluation and evaluative research should be mentioned, as should the distinction between evaluation defined as the provision of information for judging decision alternatives vs. the determination of worth. To be consistent with evaluation concepts presented in this module, the definition of evaluation that the group evolves should contain the following concepts. Evaluation is:

   - an ongoing process;
   - concerned with curriculum planning, development, implementation, and short- and long-term outcomes; and
   - conducted for the purpose of improving the curriculum and judging its worth.

2. Responses will vary depending on the examples the group members present. Hopefully, evaluations that include components representing all three evaluation approaches (accreditation, accountability, and comprehensive program evaluation) will be offered.

3. Federal requirements have placed pressure on state and local school systems to evaluate vocational education programs, but the lack of guidelines and trained personnel has resulted in confusion. University personnel have attempted to conceptualize the evaluation process into models, but the application of theory to operating programs has received less of their attention. States are now instituting data collection systems that may provide

information for evaluation and certainly will increase the reporting burden locally. On the whole, it is too early to tell whether federal vocational education evaluation requirements will promote a process that, in the end, will produce benefits for vocational education students.

4. A "comprehensive program evaluation" is possible in theory, but may require more resources (time, money, and talent) than are available. Furthermore, the benefits of such an evaluation may not be sufficient to justify expending the necessary resources. Even if questions of worth are set aside, problems of implementing, coordinating, and making sense of the results of all aspects of a comprehensive program evaluation remain. Given the current state-of-the-art in evaluation, we are not certain that comprehensive program evaluation is possible.

5. The major difference is in intent, not in procedures. However, it is unlikely that an evaluation would be conducted for solely one purpose. In reality, decisions aimed at improving a curriculum interact with those aimed at judging its worth. Typically, evaluation activities conducted to inform those decisions are not clearly distinguishable, either.

6. These three areas of vocational education curriculum evaluation should be conducted in sequence. A productive evaluation of curriculum outcomes must assume adequate curriculum implementation. Assessing curriculum planning and development should be conducted first to ensure that the curriculum is worth implementing.

GOAL 2

Individual Study Activity Responses

1. P a.

   O b.

   O c.

   P d.

   O e.

   P f.

   O g.

2. See Wentling, T. L. Evaluating occupational education and training programs. Boston: Allyn and Bacon, 1980.

3. a. 3

   b. 5

   c. 1

   d. 1

   e. 5

   f. 4

   g. 2

   h. 4

   i. 3

   j. 2

Discussion Question Responses

1. a. Examples of everyday evaluations might include the following:

   - Color of tie or scarf to wear with shirt or blouse
   - The fit of one's clothing
   - Degree of danger in driving on freeways

   The criteria for these everyday evaluations might include the following:

   - Hues and tones of clothing and their coordination
   - Conformance to body contours, tightness, or looseness
   - One's driving experience, degree of congestion of the freeways

   Purposes of everyday evaluations: Most everyday evaluations are conducted to improve one's appearance, increase comfort, improve the use of time, and, in some cases, to preserve one's safety.

   b. Some everyday evaluations that a vocational teacher might carry out include the fo lowing:

- The relative safety or cleanliness of the classroom
- The effectiveness of a particular type of instruction in a given situation
- The type of material to use in a classroom

The criteria for these evaluations might include the following:

- The amount of clutter around work areas, number of students, students' attitudes toward safety
- The number of students present, the degree of complexity of the concept or process being taught
- The expense of materials, the type of materials used in the actual work environment, the danger involved in the use of certain materials

The purposes of these evaluations: Most everyday evaluations in vocational education are designed to improve the immediate instruction, to ensure safety, or to make the learning situation as realistic as possible.

2. Response should indicate that pre-implementation evaluation is appropriate whenever there are the desire and the resources to improve a curriculum prior to its large-scale implementation. Limited resources might constrain evaluation activities. Priorities must be selected.

3. Assessing outcomes means determining whether intended outcomes were achieved, whereas assessing processes means determining whether the planned activities are being carried out as intended. It is important to assess both in order to be able to attribute the attainment (or non-attainment) of outcomes to proper (or improper) implementation of the curriculum.

4. Response should include ideas such as the following:

After the exercises are ready to be implemented, try them out on at least five (no more than ten) students, using the same directions and conditions for all. Record the results of the exercises. Try to obtain some feedback from the students themselves and other instructors. Tally the results. Use the results to determine whether the exercises are worthwhile; whether they need revisions; if so, what revisions should be made?

GOAL 3

Individual Study Activity Responses

2. Response depends on individual's experience.

3. The randomized pretest-posttest control group design would probably accommodate the situation. Three of the treatments would be instruction with each of the simulators, one treatment would be just as it always has been (without a simulator), and one group might receive a treatment consisting of a new program without a simulator. Selection of group members should be random.

4. Responses depend on individual's experiences.

Discussion Question Responses

1. Discussion should focus on truth of the statement: e.g., trivial outcome data do not facilitate important decisions; all outcomes should be measurable, even difficult ones.

2. Collecting data on how the curriculum was implemented helps determine whether it was implemented properly and whether outcomes can legitimately be related to the curriculum. It helps future users implement it properly and provides a sound basis for predicting the effects of specific activities on specific audiences and conditions.

3. Discussion should focus on aspects of agreement to the statement. When no measures are used, no information results. Some measures yield at least some information, though it is important to cite the limitations of such data. Mention might be made that it is important to try to improve the adequacy of the measures.

4. Practical problems might exist such as inadequate numbers of available students, difficulty in pulling only certain students from existing groups, difficulty gaining participation of random control groups, and so forth.

5. Factors include resources (available money, personnel, time) and the complexity of the data and evaluation needs.

Self-Check

GOAL 1

1. List and briefly describe three approaches to vocational education evaluation.

2. Define the curriculum specialist's role in vocational education evaluation.

3. List the three essential areas of the evaluation of a vocational education curriculum.

GOAL 2

1. List three analytical activities that should be done prior to conducting an evaluation of vocational education curricula.

2. The main purpose of conducting preliminary tryouts of a vocational education curriculum is to _____.

3. List the five steps involved in conducting preliminary tryouts of a vocational education curriculum.

4. Identify the two basic types of tests likely to be used in evaluating vocational education curricula.

5. The evaluation design most appropriate for use in preliminary tryouts is the _____.

6. The sample of persons involved in tryouts is likely to number

   a. 5

   b. 15

   c. 25

   d. 2 classes

7. Data from preliminary tryouts are most likely to be processed by

   a. hand

   b. card sorter

   c. computer

   d. a combination of the three

GOAL 3

1. The main purpose of conducting an implementation evaluation of a vocational education curriculum is to _____.

2. List the five steps involved in conducting an implementation evaluation of a vocational education curriculum.

3. Identify three types of data that should be sought from an evaluation of a vocational education curriculum.

4. Identify five characteristics (considerations of adequacy) of good measurement techniques.

5. The evaluation design most appropriate for use in an implementation evaluation is one in which _____.

6. The sample used in an implementation evaluation should be _____ of the defined audience and should be _____ selected.

7. The number of persons in each group tested should be no lower than

   a. 10

   b. 25

   c. 50

   d. 100

8. List three ways in which descriptive data may be presented.

Self-Check Responses

The answers that follow will give you an idea of the types of response expected. Use them as a study tool if you wish.

GOAL 1

1. Accreditation approach: Self study and peer review conducted to ensure that educational programs and institutions meet minimum quality standards and achieve goals.

   Accountability approach: Aggregate data collected and reported to show that educational funds are wisely spent for intended purposes.

   Comprehensive program evaluation approach: Examination of program planning, operation, and outcomes using input from many sources conducted to improve the program or judge its worth.

2. to collect data and make decisions to improve his or her product (the curriculum) and judge its worth

3. An assessment of curriculum planning and development
   An assessment of curriculum implementation
   An assessment of the outcomes of a curriculum

GOAL 2

1. - Review intended curriculum outcomes.
   - Review logic linking proposed activities to desired outcomes.
   - Divide curriculum into components, if necessary.

2. ...help improve the curriculum prior to and during its early implementation; to improve the ultimate product.

3. - Plan the tryouts.
   - Develop process and outcome measures.
   - Select a sample and an evaluation design.
   - Conduct the tryouts.
   - Process, analyze, and use data to revise curriculum.

4. - Written tests
   - Performance tests

5. ...one-group pretest-posttest design

6. a

7. a

GOAL 3

1. ...assess the effectiveness of the curriculum in attaining intended outcomes and to facilitate decisions regarding the future of the curriculum.

2.
- Plan the evaluation.
- Develop measures.
- Select an evaluation design and sample.
- Conduct the evaluation (collect the data).
- Process and analyze the data.

3.
- Outcome data
- Process data
- Data on unintended side effects (outcomes)

4.
- Objectivity
- Reliability
- Validity
- Efficiency
- Non-reactivity

5. Outcome measures (tests) are administered to a control and an experimental group both before (pretest) and after (posttest) the curriculum is implemented.

6. ...representative
...randomly

7. b

8.
- Tables
- Statistical summaries
- Graphs

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VECS Module Titles

Module 1: Vocational Educators and Curriculum Management

Module 2: The Scope of Vocational Education

Module 3: Organization of Vocational Education

Module 4: Legislative Mandates for Vocational Education

Module 5: Priorities in Vocational Education

Module 6: Vocational Education for Students with Special Needs

Module 7: Vocational Needs Assessment and Curriculum Development

Module 8: Conducting Task Analyses and Developing Instructional Objectives

Module 9: Selecting Instructional Strategies and Assessing Student Achievement

Module 10: Relating Learning Differences and Instructional Methods

Module 11: Selecting and Preparing Instructional Materials

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