The contribution of Robert E. Norton, DACUM Program Director of the "Center on Education and Training for Employment" (CETE) at Ohio State University, describes one approach to curriculum development. We have included extracts from the DACUM Handbook in the Basic Texts in order to encourage you to take a critical look at other approaches to curriculum development, which are becoming more widespread.

"Develop A Curriculum (DACUM)" involves developing lists of job-specific skills needed for the work process and of the general knowledge and skills, worker behaviour, tools, equipment, material, supplies, and so-called "enablers" including future job trends and concerns, that are the expected output of the teaching and learning process. The heart of the DACUM approach is no different from our own, but it is significantly more restricted in some ways, since it is applied purely to currently observable jobs. DACUM covers only one area of the analysis of the labour, goods and services markets included in our own approach (CURRENT). This brings with it the danger that efforts will focus too closely on current needs, will foster an insufficient level of basic education and an inadequate ability on the part of learners to adapt and continue learning.

On the other hand, the inventors of DACUM too see the implementation thereof as only one (important) component, a tool for analysis within the scope of the "Systematic Curriculum and
Instructional Development (SCID)". The "job/occupational analysis", "task verification process" and "task analysis process" are only three of the 23 components of SCID. Only at SCID level (i.e. not during DACUM) are the general conditions on the labour, goods and services markets, the institutional features of the training sector and the didactic and methodical processing of the competence transfer taken into account.

DACUM is based on the assumption that the skilled workers themselves are best able to describe the competencies needed to perform their work. The main source of information for the analysis is thus a committee consisting basically of 5-12 "expert workers". The results of the analysis will be largely shaped by the identification of suitable expert workers, meetings with the employers affected and the representative selection of members. The criteria used to select the members of a committee are so demanding (high level of technical competence, knowledge of job-specific development prospects, extremely good communications skills, full-time employees, independent) that they can only be met by those employed in more complex occupations or fields of activity in the modern sector. It is unrealistic to expect actors in the informal or subsistence sector to meet these stringent requirements.

The "committee", with the help of a specially trained "facilitator" draws up a list (DACUM-Chart) of job tasks/duties, general knowledge and skills, "worker behaviors", tools, equipment, supplies, and materials needed and future trends/concerns, at a DACUM workshop that

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1 It proved impossible to take a detailed look at the SCID approach within the scope of these comments, or indeed as a separate basic text in its own right, since the pertinent
generally lasts only two days. These lists are taken as the basis for the "competency-based education (CBE)" and the resultant "instructional development" material is only available in conjunction with a workshop.
What is DACUM?

DACUM is an acronym for Developing A Curriculum. DACUM as used widely today is a unique, innovative, and very effective method of job, and/or occupational analysis. It is also very effective for conducting process and functional analyses. The DACUM analysis workshop involves a trained DACUM facilitator and a committee of 5-12 expert workers from the position, occupation, or other area of analysis. The profile chart that results from the usual two-day workshop is a detailed and graphic portrayal of the duties and tasks performed by the workers involved.

In addition to the development of precise duty and task statements, lists of the general knowledge and skills, worker behaviors, tools /equipment /materials /supplies, and future job trends /concerns are also identified.

DACUM is based on three logical premises:

1. **Expert workers can describe and define their job/occupation more accurately than anyone else.** Persons who are working full-time in their positions are the real experts on that job. Even though supervisors and managers usually know a lot about their subordinates work, they usually lack the expertise needed for a high quality analysis.

2. **An effective way to define a job/occupation is to precisely describe the tasks that expert workers perform.** A successful worker performs a variety of tasks that either the customer or employer wants performed. Possessing positive attitudes and knowledge alone are not enough. Hence, finding out what the expert workers (top performers) do will give us the opportunity to prepare other experts.

3. **All tasks, in order to be performed correctly demand the use of certain knowledge, skills, tools, and positive worker behaviors.** While the knowledge, skills, tools, and worker behaviors are not tasks,
they are enablers which make it possible for the worker to be successful. Because these four enablers are so important, considerable attention is given during the DACUM workshop to identifying lists of each. Because these attributes are different and distinct from the tasks, it is very important to keep them separate if a high quality analysis of job performance requirements is to be obtained.

DACUM has been used very effectively to analyze occupations at the professional, managerial, technical, skilled, and semiskilled levels. It has also been used effectively to conceptualize future jobs, and to analyze portions (selected duties) of one’s occupation. Recently, with the increasing emphasis on quality brought forth by the TQM (Total Quality Management), ISO 9000, and QS 9000 movements, DACUM also has been used widely as a basis or foundation for analyzing various industrial systems and processes.

In terms of its common use today, the DACUM term is a misnomer. DACUM means “Developing A Curriculum” but in common practice it is used to refer to the highly visible two-day analysis workshop. At the Center on Education and Training for Employment (CETE) we use it to refer to most of the analysis phase of a five phase model known as SCID\(^1\) (Systematic Curriculum and Instructional Development). (...)\(^2\) Specifically, at CETE, DACUM is usually used to refer to three key components of the analysis phase as follows:

1. A-2; the job/occupational analysis workshop,
2. A-3; the task verification process,
3. A-5; the task analysis process.

For many external users, DACUM refers only to the job/occupational analysis workshop which is the most outwardly visible component. At this stage in its almost 40 year history, one is best advised to seek clarification from the user as to the specific meaning intended.

(...)

**Why is DACUM Unique?**

DACUM is unique for several reasons when compared with the interview and observation and many other traditional approaches to job/occupational analysis. The combination of the power of the following features make it the most effective and highest quality analysis process available at this time.

**DACUM Advantages**

- **Group interaction** - committee members freely share ideas and hitchhike on each others contributions.

\(^{1}\) A brief definition of the "Systematic Curriculum and Instructional Development" can be found in Annex 5 of this basic text.

\(^{2}\) The original has been abridged where indicated with inverted commas.
• **Brainstorming power energized** - the brainstorming process is used several times to maximum advantage to identify all of the duties and tasks.

• **Group synergy** - properly facilitated, members of the group motivate and empower each other to produce a high quality product.

• **Group consensus** - members of the committee with the facilitator's guidance assess each contribution and refine it until agreement is reached.

• **Future-oriented** - the committee is specifically asked to specify future occupational trends and concerns that are likely to change their job in the future.

• **Employee/Learner buy-in** - once the employees and learners know that practicing expert workers identified the duties and tasks, support for the results of the analysis is greatly enhanced.

• **Comprehensive outcome** - when 5-12 expert workers are motivated and guided for two days by a qualified facilitator, all duties and tasks are usually identified along with the related general knowledge and skills, worker behaviors, tools and equipment, and future trends and concerns.

• **Superior quality** - its the combination of the features already mentioned plus the fact that whenever one committee member speaks the other (4-11) members who are well qualified to do so, assess and modify contributions so as to maximize quality.

• **Low cost** - because of the highly efficient procedures used, a DACUM analysis can usually be completed in two days rather than the 25-30 days required by some methods, thus greatly reducing the overall cost.

When the DACUM committee creates its own chart from scratch, the substantive involvement of the committee members usually results in very strong support and buy-in that cannot be obtained any other way. Committee members at the end of the two-day workshop frequently offer to donate materials or equipment to the program. Other types of contributions have included offers to help recruit students, to serve as guest speakers, to host field trips, and provide site-based learning experiences for apprentices and cooperative education students.

**Why Use DACUM?**

There are many reasons for using the DACUM process. The success of any company or organization is always affected by the *Quality* of its employees. To produce and maintain a highly skilled workforce, schools, colleges, and companies must offer the highest quality of education and training possible to prepare present and future employees for the challenges they face.

Accurate and specific job information is essential to good decision-making in all areas of human resource development and management. All of the approaches to quality improvement and management -TQM, ISO 9000, QS 9000, etc. require participating companies to secure and utilize precise and
detailed information about their workers roles and responsibilities - work processes, systems, duties, and tasks. **Job/occupational analysis** is the best method available for collecting that type of information. And DACUM is the best means of conducting job/occupational analysis that is available.

Why is DACUM the best method? The excellent quality of the **product** obtained (results) and the superior **process** used (committee of 5-12 expert workers interacting) are but two of the many important advantages. Review an earlier section to learn more about the powerful group interaction, group synergy, group consensus, future orientation, and how the power of brainstorming is harnessed during DACUM workshops. Few, if any, of these positive actions can be obtained using other approaches to analysis.

The DACUM methodology is widely used in the United States, Canada, and several other countries simply because it is:

- Highly effective
- Quick
- Low cost

Another reason why DACUM is extensively used by educators and by trainers when they are establishing a new education or training program or revising an existing one is that they must somehow carefully answer the question of: WHAT SHOULD BE TAUGHT?

This, while being a very important question, is not an easy one to answer in a quality way. And yet this very important question has to be answered by someone or some group for every training and educational program offered. How do you answer it in your school, college, company, agency, or business?

All too often there is a big gap between what is offered to learners in the classroom/lab and what is going on in the real world of work. (...) This **very serious gap** between what is offered and what is needed is caused by what
the writer has referred to as the "Curriculum What Errors." These errors can be stated in many ways but may be summarized as twofold:

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<td>1. Failure to teach <strong>what</strong> should be taught (the latest concepts, methods, skills, techniques)</td>
<td>2. Teaching: <strong>what</strong> should not be taught (the outdated concepts, processes, technology, information)</td>
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These what errors are very serious and very costly. They, in reality, cheat the learner, the taxpayers, and the companies. DACUM is an effective, quick, and low cost process for significantly reducing these errors.

(...) 

Clearly, for **educators** a curriculum base that is soundly determined with maximum input from the businesses who are going to employ the students is needed. For **business trainers** and developers, a curriculum base is needed that is specific to the companies needs and that has been developed in such a way as to obtain strong employee buy-in.

To permit any company or educational agency to identify its own localized research base for curriculum development, an alternative to traditional, time-consuming, and costly approaches to job/occupational analysis was needed. DACUM has become that powerful alternative!

Another reason why DACUM is particularly well suited for educational institutions and training agencies that are implementing or are planning to implement competency-based education (CBE)\(^1\) or performance-based training (PBT) programs is that the first essential element in any CBE/PBT program involves the careful identification of the tasks (which are usually referred to as the competencies to be obtained) upon which the instructional program will be based. (...).

**For Educators**

An additional benefit that is very important to schools and colleges is DACUMs public relations value to the educational institution or other agency doing the DACUM. Once employers understand the purpose and the process of DACUM, their first reaction is almost one of sheer shock when they realize that this school or college really wants industry to help them identify the competencies needed by workers in their field. So many employers are familiar with the "rubber stamp" role that they are so often asked to perform on ad hoc committees (and sometimes even on occupational advisory committees) that it often takes them a while to understand that this school or college is really serious about wanting industry to help determine **what** tasks students must be able to perform in order to make program completers valuable future employees.

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\(^1\) A short definition of competency-based education can be found in Annex 6 of this basic text.
Once employers understand what is to be done via DACUM and how the results will be used, it is a rare employer who will refuse to cooperate. Instead, many colleges who have used DACUM report such reactions as the following:

- Offers of equipment (loans and gifts) and supplies
- Offers to host field trips
- Willingness to provide subject matter experts
- Offers of supportive training materials
- Offers of resource persons to help teach in emerging technology areas
- Requests for inservice training programs to meet local industry needs
- Increased enrollments in adult upgrading programs
- Increased support of the educational institution in a variety of ways by local business, industry, labor, and management

While the public relations value of DACUM is secondary to its main purpose, its significant, long-term impact is too important to overlook or lightly dismiss. Linkages can be developed which, if properly nurtured can be long lasting and extremely beneficial.

For Business Trainers

Business needs to design new training programs quickly and effectively. The skills and competencies needed must be job or process specific, if they are to meet the companies production and quality goals. Business needs highly job-relevant training and they must reduce the start-up time and cost for the design and delivery of programs. As one company reported, they cannot afford to spend 30 or more days on an occupational analysis if a two-day DACUM workshop can do the same job better and much cheaper.

Another important benefit mentioned by many companies is that DACUM defines the "as is" of the job. It identifies exactly what is going on in the job currently. One training manager of a large company reported, "This is critical information to have because in all the DACUMs we have conducted - what the supervisors think the employees are doing and what the employees are actually doing were two different things. Once you have a clear understanding of what actually is going on in the job, then you can make logical decisions in regards to reengineering or re-structuring the job. You can answer questions such as: are all these tasks value added; should they be doing what they are doing; what do we want them to be doing that they are not doing; why have they had to take on these low value added tasks, etc. Given this detailed information, you can redefine the job from the "as is" to the "to be", to the benefit of the company."

Other reasons why companies use DACUM is because of:

- The significant employee involvement and buy-in obtained.
- The solid foundation provided for new program development.
• The basis provided for assessing the relevance of existing programs.
• The accurate job descriptions obtained.
• The detailed information provided for worker career counseling and training needs assessment.
• The legally defensible basis provided for developing competency and performance tests.
• Its ability to describe job operations, processes, and systems to meet TQM, ISO 9000, and QS 9000 quality requirements. The information it provides for job redesign.
• The basis it can provide for developing performance appraisals and task and performance standards.
• The basis it provides for developing and selecting training materials, tools, and equipment.
• It enables companies to meet ADA (American Disabilities Act) job description requirements.
• It provides the data needed to ensure job efficiency; assurance that each task within a job is value-added and efficient.

What Does The DACUM Facilitator Do?
To produce a highly skilled workforce you must offer the highest quality of education and training possible to the students and trainees. To offer that type of preparation, you must answer the question of "What should be taught" very carefully. And, teaching people about the DACUM process should be no exception to the rule.

(...) The facilitator’s job is a challenging one that requires a careful blend of knowledge and skill, science and art. Hence, it is absolutely essential that persons intending to facilitate DACUM workshops obtain appropriate training and guided practice before conducting a DACUM analysis.

What is the Difference Between the DACUM Facilitator and the DACUM Coordinator?
In the first handbook, the term DACUM coordinator was used to refer to the person who plans the occupational analysis process, makes the necessary pre-workshop arrangements -including the selection of the committee of occupational experts -and provides for verification of the tasks. He or she may or may not facilitate the actual development of the DACUM chart, however, as somewhat different skills are required for that process.

The person who actually leads the DACUM occupational analysis workshop was referred to as the DACUM facilitator. Although the same person, if qualified, can function as both the coordinator and facilitator, these functions are often handled by different persons. Whereas many persons can perform quite satisfactorily in the coordinator's role (i.e., carry out the pre-workshop
planning and arrangements and the post-workshop activities), the facilitator's job requires some special personal qualities and characteristics.

(...)

..., the facilitator should exhibit the following worker behaviors:

- A professional image and outlook
- A sensitivity for others
- The ability to establish and maintain enthusiasm
- A sense of humor
- The ability to show empathy
- The ability to display and maintain a positive image
- Patience
- The ability to make decisions

In addition, the practical experience of the author in conducting over 300 DACUM workshops indicates that the facilitator must also possess the following characteristics:

- Skill in occupational (Job) analysis procedures
- The ability to display warmth and establish rapport quickly with participants
- A high degree of sensitivity to both verbal and nonverbal communication
- The ability to motivate and encourage participants
- A willingness to assume and "act out" the role of process expert while according participants the role of content experts
- An appreciation of the value of small-group process so that participants are allowed to work things through by themselves
- Excellent listening skills and memory, since the facilitator must be able to "store" many of the participants' contributions in his or her memory and be able to retrieve them as needed
- The ability to obtain consensus from the participants

The facilitator also needs to understand the DACUM process itself, which is neither vague nor unstructured. Although there are some alternatives and some flexibility in parts of the process, it also has some definite parameters and utilizes a specific sequence.

As should now be apparent, facilitating a successful DACUM requires a multitude of skills, many of which cannot be quickly acquired. The qualities described are extremely important to successful performance as a facilitator. The process calls for more than a competent "discussion leader" or "curriculum developer."

The facilitator must establish and maintain the group's pace, balance the group's participation, clarify vague statements by probing for more details,
and insist on selection of the most appropriate action verbs, task statement modifiers, and objects (nouns) in composing duty and task statements. The facilitator must motivate and lead the group and control the process, yet never impose content judgments or decisions on the participants.

Persons who are considering becoming a DACUM facilitator should carefully assess their personal traits and characteristics before deciding to enroll in a DACUM facilitator training program. And those responsible for helping select facilitator trainees need to keep these qualities in mind so as to enable all participants to make the best investment of their time and energy.

Who Uses DACUM?

DACUM is used by:

- **Educational agencies** such as state departments of education, community and technical colleges and institutes, proprietary schools/colleges, colleges of education and universities, and secondary schools.

  (...)  

- **Business and Industry** to do all kinds of human resource development and quality management decision-making. Many businesses and industries (hereinafter referred to as businesses) are using DACUM for job and occupational analysis as a basis for training program development, job descriptions, career development, job restructuring, etc. Recently a number of companies have been very successfully using the method with some adaptation to analyze job processes and systems rather than for the more common identification of duties and tasks.

  (...)  

- **Governmental and military agencies** usually as a basis for training program development, job descriptions, job functions, or career development. DACUM has been used by federal, state, and local government agencies. The U.S. Army and Navy have also made considerable use as have personnel at the various Defense Supply Construction Centers.

  (...)  

- **Agencies in Other Countries** for much the same reason that U. S. educational agencies, businesses, and governmental agencies use the process. Twenty-seven countries have either requested CETE personnel to conduct training incountry or have sent personnel to the states for training.

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<th>Foreign Countries Served</th>
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<td>Australia</td>
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<td>Fiji</td>
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<td>Germany</td>
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When Should DACUM Be Used?

Although the DACUM is being used for a great many purposes, it is ideally suited for researching: (1) the competencies and skills that should be addressed in the development of new education and training programs, and (2) the competencies and skills that should be delivered by existing programs. It is also very well suited to what may be called a number of special applications which are presented later in this section.

The Development of New Program

Once the need for a new instructional program has been established, DACUM can be used to quickly identify the tasks that a successful worker must be able to perform on the job. Such use of the DACUM process will ensure that the new program will be relevant if the tasks (competencies) identified in the process are used as the basis for subsequent program planning and instructional development.

Review of Existing Programs

A DACUM committee can be convened to identify the competencies that should be delivered in an existing instructional program, just as it can be convened to identify the competencies for a new program. In this case, once the competencies have been carefully identified by industry experts, the existing program and instructional materials are examined to see if they address all the required tasks. Modifications of the education or training program are then made, where necessary, to ensure current relevance of the program.

Special Applications

DACUM has also been successfully used in what could be called "special applications" of the basic process. For example, in cases where qualified workers could not be released for a two-day workshop, modified DACUMs in which literature reviews were used to initially identify all relevant duties and tasks have been conducted with reasonable success. In these cases, one day has generally been adequate for the committee to review and accept, modify, or reject each duty and task statement derived from the literature. A weakness of this adaptation is that this approach often restricts the committee's vision and it does not provide the same opportunity for original input to program development. It also does not elicit the same support from committee members as the standard process.

DACUM has also been used successfully to identify the competencies required of workers when they are engaged in a specific portion of their total job. For example, teachers who have been successful in implementing competency-based education have been able to identify the additional competencies needed by traditional teachers who want to convert to the CBE approach.
The DACUM process has also been used by several companies to analyze various systems, operations, and processes that are the responsibility of more than one or two worker job classifications. For example in a recent analysis of a sophisticated test reporting system, engineers, technicians, support personnel, and clerical personnel were all appropriately involved because they all literally “had a piece of the action” and the process will not work without each group doing their part.

The same type of analysis, although more complex, can be performed on a system which may be comprised of several job operations or processes. With the strong demand that currently exists for meeting ISO 9000 and QS 9000 requirements, DACUM facilitators are likely to be conducting more and more process analyses.

Another way to answer the question of when should DACUM be used, is to present a specific list of some of the more common uses: See page 25 for a list of Some DACUM Uses.

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<th>Some Common Uses of DACUM:</th>
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<td>Curriculum development</td>
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<td>Curriculum review and revision</td>
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<td>Training needs assessments</td>
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<td>Competency test development</td>
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**What About DACUM Quality?**

Although the DACUM process lends itself to a number of regular and special adaptations, two critical factors are always necessary to obtain a valid and high quality DACUM chart. The first is to assemble a **committee of five to twelve (5-12) expert workers** in the area under study, and the second is to use a **trained DACUM facilitator**. Without both of these, the quality of the resulting analysis is questionable, at best.

While the **DACUM Research Chart for DACUM Facilitator** answers very well the question of what the DACUM facilitator must do to be successful, it does not provide a specific set of criteria that a facilitator can use to assess the quality of a workshop and its resulting chart. And, it appears, that a clear set of evaluative criteria is needed as the process is rapidly gaining popularity in the U.S. and throughout the world.

Most DACUM facilitators are doing an excellent job, while others are attempting to facilitate workshops without the benefit of appropriate training and without much regard for the quality of the process used or the product produced.

Far too often task statements lack appropriate qualifiers. We cannot accept task statements such as "develop a plan" or "maintain standards" and expect the reader to realize that we meant "develop a floor plan" and "maintain sanitation standards." Nor can we mix very different things together -worker behaviors, skill statements, tool and equipment statements -with actual task statements if we indeed want a high quality analysis and a solid foundation for curriculum development.
While it is gratifying that researchers and developers want to use DACUM, or some modification, in the important national standards work being undertaken, it is disappointing that the process is being misused in many situations. Some of the procedures used are so far afield from recognized DACUM standards that a different name should be used to describe their procedures. In an effort to address some serious concerns about maintaining DACUM quality, a DACUM Quality Performance Criteria checklist has been developed to help DACUM facilitators plan and conduct quality workshops and evaluate both the process and product of their workshops. (...).

Another aspect of maintaining DACUM quality deserves attention at this point. Regardless of whether the DACUM chart is for business or educational purposes, it will need to be updated every few years. It is difficult to provide guidance as to frequency of updating necessary because the amount of technological change occurring varies widely from occupation to occupation. In fields like computer technology, changes are occurring very rapidly, whereas professional and managerial occupational changes are usually slower.

Some schools and colleges have adopted a policy of revising their charts once every three to five years, depending on the amount of change believed to have occurred. A training or other type of advisory committee or council is charged with making the additional changes needed between DACUM workshops.
Expert Worker Selection Criteria

One of the most important tasks associated with the DACUM workshop is selecting committee members. Individual members selected for the DACUM workshop should possess several important qualifications. Experience suggests the following criteria should guide the selection process:

1. **Technical Competence.** Individuals selected should be highly skilled in their job and should be aware of current developments and needs in the field. Many years of employment does not necessarily qualify a person as a competent DACUM committee member. Generally, the immediate supervisor or peers of the worker(s) can recommend the most technically competent individuals.

2. **Full-Time Employment.** Individuals selected should be currently employed in the occupation on a full-time basis. This helps ensure their knowledge of and familiarity with all the aspects of the job. Some of the persons may be supervisors, as long as they are directly supervising the workers whose job(s) are being analyzed. Supervisors who have had recent practitioner-level experience in the job can provide useful insights into the job being analyzed and add a "reality check" to the process. However, no more am 20 percent of the committee should be supervisors.

3. **Occupational Representativeness.** To the maximum extent possible, the make-up of the committee should reflect the actual employment situation for the job being analyzed. If the job to be analyzed is diversified in terms of worker specifications, the committee members must be selected to reflect those specifications.

4. **Effective Communicator.** To be effective contributors, committee members should be reasonably articulate in order to explain what they do in a precise and accurate way. Because the DACUM workshop involves brainstorming and consensus seeking, committee members must also be able to listen respectfully to the views of others and participate effectively in small-group discussions.

5. **Team Player.** Committee members should be able to interact without dominating or being dominated and should not overreact to criticism or to having their contributions analyzed or reorganized. Ideally, each committee member selected should want to participate in the process. This excludes individuals who are "sent" without explanation or are simply assigned by their supervisor to "fill a seat" on the committee.

6. **Full-Time Commitment.** All committee members should be able to devote full-time to the DACUM workshop for the required period of time. It is important to stress being on time for all sessions, because individuals who are late or are part-time and who miss some of the orientation or group discussion, may seriously disrupt the workshop.

7. **Freedom From Bias.** Committee members must be open-minded and free of biases related to the nature of the job and various elements of associated training. This is the primary reason why instructors should not be committee members. Instructor's may try to influence the committee's contributions and thus adversely affect the process and how the information is shared. Instructors should be encouraged to attend the workshop as observers and as hosts to the event.
Task B-3. Develop Committee Member Profile

Two major questions to be answered at this time in the DACUM workshop planning process are: What personal characteristics should the DACUM committee represent? and How many persons of what job titles should be selected?

The following personal characteristics should be carefully considered, whatever the job or occupation being analyzed:

a. Appropriate gender mix
b. Appropriate racial mix
c. Geographic representation desired
d. Levels of job representation (e.g., in schools: elementary, junior high, senior high, or all three; in industry: apprentice, journeyperson, and/or master craftsperson)
e. Size representation (e.g., large, medium, small employers)
f. Workers' years of experience
g. Currently employed full-time, part-time

Sometimes it is safe to let the random selection of expert workers give you the desired committee member characteristics. At other time, it can be very, very important to consider the first three categories carefully.

The decision on how many persons with what job titles to select for the committee deserves careful thought. Remember that the committee members are the content experts for the entire process, and, therefore, must be selected with the utmost care. The DACUM committee should be composed of 5-12 expert workers. The ideal panel has 7-10 members. Expert workers are those who perform the various job tasks of concern and are, without doubt, in the best position to explain "what they do" that makes them successful on the job. With fewer than five persons, the power of the process and the quality of the resulting DACUM Research Chart diminishes. With more than 12 persons, the committee becomes unwieldy and the satisfaction of committee members tends to lessen due to limited opportunities for input.

The presence of too many supervisors and managers can present problems. Supervisors and managers tend to contribute less than most expert workers, and in at least some situations their presence inhibits the free exchange of ideas. It is considered okay to have one or two immediate supervisors on the committee, provided they do not try to dominate the discussion or inhibit the free input of the workers. However, these supervisors must not be supervisors of any of the expert workers on your committee. When this occurs, some of the workers are likely to be inhibited to a significant degree.

Even when only expert workers are invited, you are still likely to end up with one or more supervisors attending. Supervisors can definitely be helpful in some ways. The immediate supervisors provide a "reality check" during the
process, since they also know what the workers are expected to be able to do. The presence of one or two supervisors also limits the tendency of some workers to want to "enhance" their occupation by including management or other higher-level tasks that workers really do not perform.

Because a reasonably sized group is required to obtain fair representation of the types of workers involved in the occupation, as well as to obtain needed group interaction, a DACUM workshop should not be conducted with fewer than five members. It is best to select ten to twelve persons, so that if one or two persons cannot make it at the last minute, the committee will still be of sufficient size to function effectively.

(...)

Task B-8. Select DACUM Workshop Team

The DACUM workshop team will usually consist of four or five carefully selected persons. These persons performance will determine to a large degree the success or failure of the workshop.

Facilitator. This is the formally trained person who knows how to plan, conduct, and carry out the recommended follow-up activities of a DACUM workshop. A word of caution is in order here. Do not employ as a facilitator someone who has only read about or observed someone else conduct a DACUM workshop.

(...)

In businesses and agencies where two or more trained facilitators are available, facilitators report that they often team up to conduct a workshop. In this situation, they usually take turns rotating between the role of facilitator and recorder.

Regardless of who actually performs the pre-workshop planning and recruitment of committee members, it is essential that the facilitator monitor the process carefully to help assure needed arrangements are made and the right expert workers are selected.

DACUM Coordinator. In many businesses, government agencies, and community colleges, a person designated as the DACUM Coordinator is often assigned to carry out pre-workshop and post-workshop activities. This person will do all the marketing activities, the initial workshop planning and the recruitment of workshop committee members. The coordinator is also likely to be responsible for most, if not all, post-workshop activities such as conducting task verification and publishing the DACUM Research Chart.

If desired, there is absolutely no reason why the DACUM Facilitator cannot also perform the duties and tasks designated for the coordinator.

Recorder. A recorder should be selected to assist the facilitator from the beginning to the end of the workshop. This person's primary function is to print the duty and task statements legibly on cover stock or cards that are attached to the wall. The recorder should be able to do the following:

- Listen attentively to committee members
• Take direction from the facilitator
• Print quickly and neatly
• Spell words correctly

The recorder must resist the temptation to speak about or write task statements before the facilitator has obtained the consensus of the committee. The recorder may also be asked to transfer all information from the wall to sheets of paper at the end of each session and at the conclusion of the workshop.

**Sponsor/Host.** Usually a company, government agency, or organization will sponsor and/or host the DACUM workshop. The sponsor should be involved with all the planning and arrangements and should also be present during the workshop to greet committee members and answer questions that may arise.

**Agency/Representative.** While the sponsor may sometimes serve in this capacity, it is more common and preferred to have an official agency representative available to (1) officially greet the committee during orientation, (2) officially tell why the analysis is being conducted and how the agency plans to use it, and (3) to help define the scope of the job or occupation to be analyzed during the organizational chart brainstorming.

In a company setting, the unit manager or supervisor or someone representing the training department may serve as the agency representative. In education, a vice-president, dean, associate dean, or department head will usually serve as the official representative.
DACUM Research Chart for Computer Applications Programmer

DACUM Panel

Ed Stucky
EDS-Newtrend Group
Orlando, FL

Ed Combs
Sprint/United Telephone - Florida
Altamonte Springs, FL

Suzanne Leib
Universal Studios - Florida
Orlando, FL

Buddy Owens
Universal Studios - Florida
Orlando, FL

Darla Morse
Walt Disney World Attractions, Inc.
Lake Buena Vista, FL

Phil LaBelle
Walt Disney World Attractions, Inc.
Lake Buena Vista, FL

Nancy Rochette
City or Orlando
Orlando, FL

Frances Bowen
City of Orlando
Orlando, FL

Bill Johnson
City or Orlando
Orlando, FL

DACUM Facilitators

Sheliah Lynn
Charlotte Morris
Robert E. Norton

Produced for

VALENCIA
Community College

Developed by

CENTER ON EDUCATION AND TRAINING FOR EMPLOYMENT
COLLEGE OF EDUCATION
THE OHIO STATE UNIVERSITY
1900 Kearing Road • Columbus, Ohio 43210-1050
Phone: (614) 292-3350 or (800) 684-4615 Fax: (614) 292-1269

March 21 - 22, 1995
## Materials for the Curriculum Guide

Basic Texts

### A-IV-24

### DACUM Research Chart for Computer Applications Programmer

<table>
<thead>
<tr>
<th>Duties</th>
<th>Tasks</th>
</tr>
</thead>
</table>
| **A** Analyze Business Requirements | **A-1** Interview customers  
**A-2** Study existing process  
**A-3** Conduct focus groups  
**A-4** Benchmark "best practices" companies  
**A-5** Determine project benefits  
**A-6** Identify business rules  
**A-7** Identify legal and regulatory requirements  
**A-8** Identify hardware and software issues  
**A-9** Identify potential impact of project  
**A-10** Determine time requirements  
**A-11** Document business findings |
| **B** Develop Conceptual Design     | **B-1** Diagram process flow  
**B-2** Create logical model  
**B-3** Evaluate multiple solutions  
**B-4** Present recommended solution  
**B-5** Identify project costs  
**B-6** Develop application prototype  
**B-7** Develop performance standards  
**B-8** Conduct customer walk-through  
**B-9** Propose project schedule  
**B-10** Justify project funding |
| **C** Develop Detailed Design       | **C-1** Design data flow diagram  
**C-2** Design data files  
**C-3** Diagram program flows  
**C-4** Define screen requirements  
**C-5** Define menu requirements  
**C-6** Define report requirements  
**C-7** Define audit trails  
**C-8** Define backup/recovery requirements  
**C-9** Develop security standards  
**C-10** Update project estimates  
**C-11** Perform customer walk-through/ signoff  
**C-12** Publish program specifications |
| **D** Develop Business Applications | **D-1** Validate program specifications  
**D-2** Create application data files  
**D-3** Develop application screens  
**D-4** Develop application reports  
**D-5** Develop application menus  
**D-6** Develop application programs  
**D-7** Develop conversion programs  
**D-8** Develop backup/recovery procedures  
**D-9** Execute unit tests  
**D-10** Update written documentation  
**D-11** Create online documentation  
**D-12** Publish periodic progress reports |
| **E** Test Business Applications    | **E-1** Develop system test  
**E-2** Set up test environment  
**E-3** Execute system test  
**E-4** Review customer feedback  
**E-5** Perform necessary modifications  
**E-6** Document performance/capacity characteristics |
| **F** Implement Business Applications | **F-1** Publish implementation time line  
**F-2** Conduct customer training  
**F-3** Coordinate implementation activities  
**F-4** Archive existing environment  
**F-5** Convert production data files  
**F-6** Transfer production modules  
**F-7** Parallel existing processes  
**F-8** Obtain customer acceptance  
**F-9** Conduct post-implementation review |
| **G** Maintain Business Applications | **G-1** Provide customer support  
**G-2** Provide application enhancements  
**G-3** Resolve reported problems  
**G-4** Optimize system  
**G-5** Perform routine file maintenance  
**G-6** Respond to ad hoc requests |
| **H** Continue Professional Development | **H-1** Review trade journals  
**H-2** Attend professional seminars  
**H-3** Maintain professional certification  
**H-4** Participate in cross training  
**H-5** Participate in professional associations  
**H-6** Pursue continuing education  
**H-7** Pursue self-directed training |

March 21 - 22, 1995
### DACUM Research Chart for Computer Applications Programmer

<table>
<thead>
<tr>
<th><strong>Worker Behaviors</strong></th>
<th><strong>General Knowledge and Skills</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>· Methodical</td>
<td>· Communication skills (oral, written, listening, body language)</td>
</tr>
<tr>
<td>· Creative</td>
<td>· Knowledge of business environment</td>
</tr>
<tr>
<td>· Logical</td>
<td>· Logical thinking</td>
</tr>
<tr>
<td>· Analytical</td>
<td>· Research skills</td>
</tr>
<tr>
<td>· Detailed</td>
<td>· Teaching skills</td>
</tr>
<tr>
<td>· Flexible</td>
<td>· Design skills</td>
</tr>
<tr>
<td>· Listener</td>
<td>· Memory transfer skills</td>
</tr>
<tr>
<td>· Patient</td>
<td>· Interviewing skills</td>
</tr>
<tr>
<td>· Sensitive</td>
<td>· Testing skills</td>
</tr>
<tr>
<td>· Persistent</td>
<td>· Analytical</td>
</tr>
<tr>
<td>· Ethical</td>
<td>· Resourceful</td>
</tr>
<tr>
<td>· Positive</td>
<td>· Presentation Skills</td>
</tr>
<tr>
<td>· Team Player</td>
<td>· People skills</td>
</tr>
<tr>
<td>· Self-motivated</td>
<td>· Partnering</td>
</tr>
<tr>
<td>· Diplomatic</td>
<td>· Project management</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Tools &amp; Equipment</strong></th>
<th><strong>Future Trends/Concerns</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>· Current PC hardware</td>
<td>· Object oriented programming may replace current programming techniques.</td>
</tr>
<tr>
<td>· GUI applications</td>
<td>· Work at home and telecommunicating will increase.</td>
</tr>
<tr>
<td>· Current technical library</td>
<td>· PC technology and customer proficiency may reduce reliance on traditional programming skills.</td>
</tr>
<tr>
<td>· A development environment</td>
<td>· Increased use of C.A.S.E. tools.</td>
</tr>
<tr>
<td>· Debug software tools</td>
<td>· Analytical skill may be more important than coding skills.</td>
</tr>
<tr>
<td>· Datafile utilities</td>
<td>· Programmers will function more as business analysts.</td>
</tr>
</tbody>
</table>

· The decrease in hardware cost makes labor cost the most expensive component of business solutions.

· Outsourcing and downsizing will continue.

· Assessment of worker productivity and performance will increase.

· Worker attitudes and affective skills will be critical to career success.

· Benchmarking and the integration of "best practices" will increase.

· Utilization of client server technology will increase.
What is DACUM.

An Acronym for Developing A CurriculUM

A Process for:

(1) Job Analysis
(2) Occupational Analysis
(3) Process Analysis
(4) Functional Analysis

Used by:

Vocational-Technical Educators
Business-Industry Trainers
Government-Military Agencies

Used because its:

Effective
Quick
Low Cost

DACUM Philosophy

➢ Expert workers can describe and define their job more accurately than anyone else
➢ An effective way to define a job is to precisely describe the tasks that expert workers perform
➢ All tasks, in order to be performed correctly, demand certain knowledge, skills, tools, and worker behaviors

Key Terms

➢ Duties A cluster of related tasks
  Usually 6-12 per job
➢ Tasks Specific meaningful units of work
  Usually 6-20 per duty and 75-125 per job
➢ Steps Specific elements or activities required to perform a task
  Always two or more per task
Graphic Representation of Job, Duty, and Task Relationships

Whole Job

Job Divided Into Duties (6-12)

Job Divided Into Duties and Tasks (75-125)
Job, Duty, Task, and Step (Examples)

<table>
<thead>
<tr>
<th>JOB</th>
<th>Homeowner</th>
</tr>
</thead>
<tbody>
<tr>
<td>DUTY</td>
<td>Maintain the yard</td>
</tr>
<tr>
<td>TASK</td>
<td>Mow the lawn</td>
</tr>
<tr>
<td>STEP</td>
<td>Start the mower</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>JOB</th>
<th>Homemaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>DUTY</td>
<td>Prepare meals</td>
</tr>
<tr>
<td>TASK</td>
<td>Bake cookies</td>
</tr>
<tr>
<td>STEP</td>
<td>Mix ingredients</td>
</tr>
</tbody>
</table>

DACUM
Terms and Their Relationships

![Diagram of DACUM terms and relationships]

- **JOB**: Worker Position
- **OCCUPATION**: Occupational and Related Job Titles
- **DUTIES**: Major Areas of Work
- **TASKS**: Specific Units of Work
- STEPS AND SUPPORTING TOOLS, EQUIPMENT, SUPPLIES, MATERIALS; KNOWLEDGE; SAFETY; ATTITUDES; DECISIONS, CUES, AND ERRORS; PERFORMANCE STANDARDS
- Specific Work Activities and Enablers
Job and Task Analysis

Whole job or occupation, process or function.

Job or occupation, process, or function divided into **DUTIES**

**DUTIES** divided into **TASKS**

Task Analysis

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Steps:</td>
<td>1.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>2.</td>
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<td></td>
<td>3.</td>
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<td></td>
</tr>
</tbody>
</table>

Duty Statement Guidelines

**Duty Statements:**

- Describe large areas of work in performance terms
- Serve as title for a cluster of related tasks (usually 6-20/duty)
- Consist of one verb, an object, and usually a qualifier
- Are general, not specific., statements of the work that is performed (usually 6 - 12/job)
- Stand alone (are meaningful without reference to the job)
Avoid references to workers behaviors, tools, and knowledge needed

**Developing Task Statements**

The Components of a Task Statement are:

- **Verb**: The verb must be in the first person singular, active voice. (e.g., select, prepare, maintain, develop, determine)
- **Object**: The object is the thing acted upon by the worker. (e.g., reports, equipment, records, customers)
- **Qualifier**: Qualifiers are words or phrases used to modify and clarify the task statement. (e.g.,... record "health" history; develop a "financial" plan, bake "oatmeal raisin" cookies, weed the "flower" garden)

**Job Task Criteria**

**Job Tasks:**

- Represent the smallest unit of job activity with a meaningful outcome
- Result in a product, service, or decision
- Represent an assignable unit of work
- Have a definite beginning and ending point
- Can be observed and measured
- Can be performed over a short period of time
- Can be performed independent of other tasks
- Consist of two or more steps

**Task Statement Criteria**

**Task Statements:**

- Concisely describe a task in performance terms
- Should have a single action verb and an object that receives the action
- Usually contain one or more relevant qualifiers
- Are explicitly stated (crystal clear)
- Are meaningful by themselves (not dependent upon the duty or other tasks)
- Avoid references to worker behaviors needed
Avoid references to tools and equipment that merely support task performance
Avoid references to the knowledge needed

DACUM Procedural Steps
1. Orient the committee
2. Review the job/occupation:
   a. Conduct initial brainstorming
   b. Develop organizational chart
3. Identify duties (general areas of responsibility)
4. Identify specific tasks performed
5. List:
   a. General knowledge and skill requirements of the job
   b. Worker behaviors (desirable attitudes and traits)
   c. Tools, equipment, supplies, and materials
   d. Future trends/concerns
6. Review/refine task and duty statements
7. Sequence the task and duty statements
8. Other options as desired

Major DACUM Workshop Outcomes
- Precisely stated job tasks/duties
- General knowledge and skills
- Worker behaviors
- Tools, equipment, supplies, and materials
- Future trends/concerns
- Terms/Acronyms (optional)
SCID: A Model for Effective Instructional Development, by Robert E. Norton

HOW DO YOU SAVE MONEY ON CURRICULUM DEVELOPMENT? By using a new model that is so efficient and effective, it practically guarantees the production of relevant high-quality CBE materials at the lowest possible cost. The SCID model was carefully developed to incorporate the critical tasks needed to develop the kinds of CBE curriculum and instructional materials needed to train tomorrow’s workforce today. Twenty-three components—a few optional but most essential—are grouped into five phases: Curriculum Analysis, Curriculum Design, Instructional Development, Training Implementation, and Program Evaluation.

Phase 1. Curriculum Analysis comprises six components. First is a needs analysis, in which actual needs are determined, for example the need for training, for a change in management or production procedures, for updated technology, or some combination of needs. If the need for training is confirmed, a job analysis is next (the DACUM approach is recommended). Next is task verification, which can extend involvement in the job analysis from a few to 100 or more expert workers and can provide a means of rating the importance and difficulty of each task and obtaining other valuable decision-making information.

Armed with this information, it is possible to select tasks (or deselect them, as some industry trainers say) for inclusion in the program.

The next component in this phase is the standard task analysis. The information obtained in this step is absolutely essential in identifying performance steps and decisions, essential knowledge, industry standards, etc. needed to develop accurate and relevant teaching and learning materials. A sixth component, the literacy task analysis is recommended but is optional here.

Phase 2. Curriculum Design comprises four components. Based on information collected in Phase 1, it is necessary to make decisions about the training approach - type of instructional program and materials to be developed, the degree to which instruction will be individualized, and support media to be developed. Next is the development of learning objectives for each task or group of tasks, followed by the development of job performance measures. This phase concludes with the preparation of a training plan, which should be fairly detailed and include all aspects of personnel and facility and equipment needs. Implementation of this plan must occur concurrently with the development phase.

Phase 3. Instructional Development comprises four main components, although depending on the type of materials to be produced, the first two components may vary. One choice—usually for competency- or performance-based programs—is to develop a competency profile and then to develop learning guides or modules. The second choice—usually for more traditional programs—is to develop a curriculum guide and then to develop lesson plans. The third component in either case is to develop supporting media, which can be simple transparencies, posters, and slides, or more expensive videotapes or interactive videodiscs. Appropriate media add variety and clarity to the instructional process, motivate the learner, and help demonstrate or illustrate difficult concepts and procedures. The last step in development is to pilot-test and revise the materials. This step is important and worth the extra time and money to make needed improvements and modifications. Keep in mind that the purpose of these materials is to help learners achieve the performance objectives as efficiently, effectively, and economically as possible. In many cases, existing materials and resources may be used or adapted.

Phase 4. Training Implementation comprises four components, beginning with activating the training plan developed in the design phase. By now, learners have been recruited, instructors selected and trained, and the availability of facilities, supplies, equipment, and other resources confirmed. The next step, after pretesting, is to conduct the training and then to conduct a formative evaluation of learner and instructor performance. This information is invaluable in making in-course corrections, should this become necessary. Documenting training in the form of student achievement and instructor performance records is the final step in this phase. The student competency profiles can be used to report achievement to parents and potential employers as well as to administrators.

Phase 5. Program Evaluation, the final phase, comprises three components. With the formative evaluation complete, the next important step is to conduct the summative evaluation to collect data for use in decisions on maintaining or improving the education or training program. This involves gathering data on the overall instructional process, program outcomes, student follow-up, worker productivity, and cost-effectiveness. Analyzing and interpreting this information will lead to recommendations on program improvement and, finally, taking corrective actions. Completion of the evaluation phase produces the performance data and feedback vital to any education or training system concerned with quality management and proving its worth.

The Center on Education and Training for Employment periodically conducts workshops on the SCID model. If you would like to find out more about this training activity for your organization, contact Bob Norton at CETE, The Ohio State University, 1900 Kenny Rd., Columbus, OH 43210-1090, (800) 848-4815 or (614) 292-4353.
PHASES

A--ANALYSIS

MAJOR COMPONENTS

A-1
Conduct
Needs
Analysis

A-2
Conduct
Job
Analysis

A-3
Conduct
Task
Verification

A-4
Select
Task for
Analysis

A-5
Conduct
Standard Task
Analysis

A-6
Conduct
Literacy Task
Analysis

B--DESIGN

B-1
Determine
Training
Approach

B-2
Develop
Learning
Objectives

B-3
Develop
Performance
Measures

B-4
Develop
Training
Plan

C--DEVELOPMENT

C-1-a
Develop
Competency
Profile

C-1-b
Develop
Curriculum
Guide

C-2-a
Develop
Learning
Guides/
Modules

C-2-b
Develop
Lesson
Plans

C-3
Develop
Supportive
Media

C-4
Pilot-Test/
Revise
Materials

FEEDBACK

D--IMPLEMENTATION

D-1
Implement
Training
Plan

D-2
Conduct
Training

D-3
Conduct
Formative
Evaluation

D-4
Document
Training

E--EVALUATION

E-1
Conduct
Summative
Evaluation

E-2
Analyze
Information
Collected

C-3
Initiate
Corrective
Actions

SYSTEMATIC CURRICULUM AND INSTRUCTIONAL DEVELOPMENT (SCID)

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CBE: AN EFFECTIVE AND REALISTIC APPROACH TO EDUCATION AND TRAINING

by Robert E. Norton

Traditionally, in education and training, we have accepted the Option of making learning the variable and time the constant. Whenever we say that a course involves so many hours of instruction, we are openly admitting our acceptance of this historical and ineffective approach. A set number of hours per course is admittedly an administrative and planning convenience that is hard to give up. However, under these circumstances, our teaching is often geared to covering as much information as possible in the time permitted, in hopes that enough will be learned to allow our students/trainees to be successful.

Many persons feel it is time that those of us involved in training and education should be opting to implement programs in which learning is the constant and time the variable. Vocational educators in many states, including New York, Kentucky, Florida, North Carolina, Ohio, Texas, Wisconsin, and Pennsylvania, are currently working hard to make this option a reality in their vocational and technical education programs through the implementation of competency-based education (CBE).

Business and industry trainers far more commonly refer to their PBE (performance-based education) or PBI (performance-based instruction) programs. Many, many companies including Motorola, Dofasco, AT&T, Ericsson, General Motors, and United Airlines want programs that will prepare employees to perform at high levels of quality and efficiency.

Before proceeding, it should be noted that terms and acronyms for these programs abound: CBE, PBE, PBI, CBI. What is important is that all such programs, regardless of the specific names attached to them, should possess the essential and desirable characteristics described below in order to be considered truly competency- or performance-based.

To understand fully the meaning of CBE, one must be aware of the essential elements and desirable characteristics of such programs.1 There are five essential elements:

1. Competencies to be achieved are carefully identified, verified, and made public in advance - This simply means that the important entry-level competencies for any occupational program area must be identified in some appropriate manner, verified as relevant by experts who know that field, and then made known to students, trainees, and everyone else interested in what the program is designed to teach.

2. Criteria to be used in assessing achievement and the conditions under which achievement will be assessed are explicitly stated and

---

1 The essential elements and desirable characteristics presented here are adapted from Achieving the Potential of Performance-Based Teacher Education: Recommendations, PBTE Monograph Series: No. 16 (Washington, DC: American Association of Colleges for Teacher Education, 1974).
made public in advance - This means we are going to eliminate guessing games about what parts of the course are important and tell students/trainees exactly how their performance will be evaluated. The implementation of this essential element also means that we are giving up the traditional norm-referenced approach to the evaluation of student achievement in which the focus is on comparing a learner's progress with that of other learners. In its place, we are adopting the criterion-referenced approach in which each individual learner's progress is compared with previously established criteria that are made known to all who are concerned.

3. The instructional program provides for the individual development and evaluation of each of the competencies specified - What we are saying here is simply that each learner shall be given the opportunity to develop each of the competencies important to his/her training program, and that each learner will be given the opportunity to demonstrate attainment of each competency. This essential element has strong implications regarding the need to individualize CBE programs to the maximum extent possible and for the type of instructional materials needed to make individualization possible.

4. Assessment of competency takes the learners' knowledge and attitudes into account but requires actual performance of the competency as the primary source of evidence - CBE goes beyond the traditional educational expectations that learners should know the "how" and "why" of things and places a strong emphasis on the "ability to do" as well. Of course, in order to perform a task correctly, the student/trainee will need to acquire the necessary prerequisite knowledge and attitudes. Acquiring the necessary prerequisite knowledge and attitudes involved, however, does not by itself ensure the learner's actual ability to perform important competencies. It is with regard to this essential element of CBE that many programs fall short, relying instead only upon paper-and-pencil tests of cognitive understanding as proof of competency. While such measures can appropriately be used to assess prerequisite knowledge, they must be supplemented by performance-oriented, process, product, and attitudinal checklists or other measurement devices that permit assessment of the learner's actual ability to perform the expected competencies.

5. Students/trainees progress through the instructional program at their own rate by demonstrating the attainment of specified competencies - Said another way, time is the variable and learning the constant. Again, it is clear that some individualization of instruction is called for. While student progress is dependent upon the demonstration of competencies, this element does not mean that reasonable time limits cannot be imposed upon the learners. Some persons may want to interpret this element to mean that only the student is accountable for his/her progress. Not so - a CBE program places accountability for learning squarely upon the shoulders of both the learner and the instructor.
The additional desirable characteristics of CBE programs are as follows:

1. Instruction is individualized to the maximum extent possible, rather than group-paced.
2. Learning experiences are guided by frequent feedback.
3. Emphasis is on helping the learner achieve program exit requirements.
4. Instruction is individually paced rather than time-based.
5. Instruction is, to a considerable extent, field-centered-based on realistic work problems and situations.
6. Instruction is often modularized and uses materials with both required and optional learning activities to help achieve flexibility and provide for different learning styles.
7. The program as a whole is carefully planned and systematic (e.g., concerned staff are involved in planning, and evaluation data is used for program improvement).

To help the reader visualize some of the major differences between a CBE program and a conventional program of education and training, twelve factors related to each of the programs are presented below. Admittedly, few of today's programs would meet exactly the criteria for either type of program. While most actual programs are probably located somewhere between the two extremes, the comparison helps, to summarize some of the basic differences inherent in the two approaches.

**Conventional Vocational Programs**

1. Content-Based
2. Time-Based
3. Group Paced
4. Group Needs
5. Delayed Feedback
6. Textbook/Workbook Materials
7. Limited Field Experience
8. Lectures, Demonstrations
9. General Objectives
10. Subjective Criteria
11. Norm-Referenced
12. Final Grades

**Competency-Based Vocational Programs**

- Competency-Based
- Performance-Based
- Individually Paced
- Individual Needs
- Immediate Feedback
- Modules and Media Materials
- Learning in the Field
- Assistance of Resource Person
- Specific Objectives
- Objective Criteria
- Criterion-Referenced
- Learner Competence

Whether you are implementing your own CBE program, helping another teacher or instructor implement such a program, or in the position of evaluating programs implemented by others, some means of formative evaluation can be very helpful. With the essential elements and the desirable characteristics in mind, a Competency-Based Education Program Evaluation Checklist (see figure 1) has been devised to help you assess the status of any CBE program. It is recognized that different states, school systems, and companies have somewhat differing philosophies about what CBE is and, hence, the checklist
may have to be modified to fit local philosophies. Nevertheless, it is felt that the criteria listed reflect the minimum essential program elements that are generally recognized as necessary to assure overall program quality. It is hoped that the instrument can be used in a positive way to promote further the implementation of high-quality CBE programs that will better meet the education and training needs of our youth and adults.
(APPENDIX C)

DACUM AND CBE TERMINOLOGY

Activity - A series of one or more actions necessary to complete a task. Also commonly referred to as steps or elements.

Common-core competencies - A group of competencies required by many jobs within an occupational cluster.

Competence - Achievement of the knowledge, skills, and attitudes required by a worker in order to perform a given occupational task.

Competency - A description of the ability one possesses when they are able to perform a given occupational task effectively and efficiently.

Competency-Based Education (CBE) - An instructional program that derives its content from verified tasks and bases assessment on student performance. The tasks (competencies) the student is to learn and perform in these programs are based on tasks which are carefully identified and verified in advance of instruction. The criteria by which the student will be evaluated, and the conditions under which evaluation will occur are also specified. Instruction emphasizes the ability to DO as well as knowing the how, and why. Student performance and knowledge are evaluated individually against stated criteria, rather than against group norms. Programs of this type are also sometimes called performance-based education (PBE) and performance-based training (PBT).

Competency Profile - A graphic portrayal of all the duties and associated task statements important to workers in a given occupation. Also used are the terms task list, occupational profile, and DACUM Research Chart.

Coordinator - The person in some companies and agencies who plans the DACUM occupational analysis process, makes the necessary pre-workshop arrangements -including the selection of the committee occupational experts- and provides for post-workshop activities such as verification of the task statements.

Criterion-Referenced Measure - An instrument composed of items (criteria), established in advance of instruction, that are used for assessing the students' development of knowledge, skills, and/or attitudes as stated in the performance objective. The criteria are based on occupational standards and do not involve comparing the performance of one student against the performance of other students.

Curriculum - A description or compilation of statements about "what is to be learned" by students in a particular instructional program; a product that states the "intended learning outcomes" that have been selected and ordered.

DACUM - An acronym for Developing A Curriculum. It is an approach to job, occupational, process, and functional analysis that involves bringing a committee of expert workers together under the leadership of a trained facilitator. Modified brainstorming techniques are used to specify in detail the duties and tasks that successful workers in their occupation must perform. The general knowledge and skills needed, important worker behaviors, tools and equipment, and future trends and concerns are also identified. The Center also defines DACUM as including the task verification and task analysis components of the analysis phase of curriculum development.

DACUM Research Chart - This is the name given to all DACUM charts developed by the Center on Education and Training for Employment at Ohio State University. Each chart contains a graphic portrayal of the duties and tasks identified, plus the four descriptive lists of: 1) general knowledge and skills, 2) worker behaviors, 3) tools, equipment, supplies, and materials, and 4) future job trends/concerns.

DACUM Research Chart Bank - This is a listing of over 300 DACUM Research Charts produced by Center personnel or Center trained facilitators. They are available for purchase at
the: Center on Education and Training for Employment, 1900 Kenny Road, Columbus, OH 43210.

DEX - the DACUM Exchange also collects and distributes DACUM charts. It is housed at Humber College, 205 Humber College Blvd., Rexdale, Ontario, Canada M9W5L7.

Duty - A cluster of related tasks from a broad work area or general area of responsibility (area of competence).

Educational (Training) Program - The complete curriculum and instruction (what and how) that is designed to prepare a person or group of persons for employment in jobs or other performance situations.

Enabling Objective - A process-type objective that helps students progress toward achievement of a performance objective.

Facilitator - The person who leads the DACUM occupational analysis workshop to identify the actual job duties and tasks, and related information.

Feedback - A learning activity in which the learner is provided with information about his/her progress through model answers, model critiques, product/performance checklists, or other means.

Functional Analysis - Similar to occupational analysis and used to determine the duties and tasks performed by workers assigned to more than one area of job responsibility. For example, in state employment service agencies, workers may be assigned to one or more of the following: orientation, intake, assessment, case management, employer services.

Individualized Instruction - An approach for managing the instructional process where the focus is on helping individual learners (as opposed to groups of learners) acquire the knowledge, skills, and attitudes needed. It is geared to the student's own needs, learning preferences, and rate of learning.

Information (instruction) Sheet - Segment of a learning package (module or learning guide) that is used to provide attitudinal and cognitive information to the learner.

Instruction - Whereas curriculum identifies the content or "what is to be learned," instruction is the process, the how, or the means by which the intended learning will be achieved.

Job - A specific position requiring the performance of specific duties and tasks - generally the same tasks are performed by all workers having the same title.

Job Analysis - Identification of the duties and tasks that comprise a single job like carpenter or plumber.

Learning Activities - The required and/or optional procedures that students complete when using a learning package. For instance, they may tell a student to view a videotape, complete an activity sheet, etc. They include information sheets, activity sheets, job sheets, self-checks, case studies and many other types of activities.

Learning Package - A generic term used to describe the many types of student learning materials used in most CBE/PBT programs. Two commonly used types are learning guides and modules.

- **Learning Guide** - A type of learning package that usually contains a performance objective, enabling objectives, a series of learning activities, a listing of the external supportive resources needed, and feedback activities. While learning guides are developed in a wide variety of formats, most are dependent upon external resources to provide most of the essential content needed.

- **Module** - A type of learning package that usually includes a performance objective, enabling objectives, essential attitudinal and cognitive information; planning or practice activities, and feedback activities. While modules are developed in a wide
variety of formats, most are self-contained, transportable, and designed for either individual or group use.

**Occupation** - A work area that consists of two or more related jobs or levels. For example, in apprenticeable fields, the entry level worker may be an apprentice, followed by a journeyman, and a master craftsman. There is always some commonality to the tasks performed.

**Occupational Analysis** - A process to identify the duties and tasks that are important to workers in any given occupation. A number of alternative approaches to occupational analysis are available. Also sometimes is called job analysis.

**Occupational Cluster** - A grouping of jobs that are related by the similarity of the tasks performed by the various workers.

**Open-Entry/Open-Exit** - Open-entry/open-exit enrollment is an administrative device designed to make competency-based and individualized instruction more feasible and useful. It allows the trainee to: 1) enter the vocational program at virtually any time an appropriate work station is available, and 2) exit the program without penalty whenever the specified competencies or tasks have been achieved, or when an alternative decision has been made. Thus, trainees are not enrolled or discharged on only a few dates in the year, neither are they arbitrarily required to remain enrolled in a program for stipulated number of weeks, months, or years.

**Performance-Based Training (PBT)** - A term that means the same as CBE but is often preferred by industry.

**Performance Checklist** - A list of specific criteria, usually based on actual occupational standards, that is used to evaluate the process used and/or product developed by a worker when performing an occupational task. These checklists should also include worker behaviors and performance time criteria when appropriate.

**Performance Standard** - Criteria which the trainee/worker must meet when performing a task.

**Process Analysis** - Similar to an occupational analysis, this involves identifying the duties and tasks performed by a small group or team of workers with a common job assignment but with different job titles and responsibilities. For example, a manager, engineers, technicians, and skilled workers may all be assigned to a single common process. This type analysis is used by many companies to help meet ISO 9000 and QS 9000 standards.

**Resource Person** - The professional educator who is directly responsible for guiding trainees and helping them plan and carry out their professional development programs.

**Resources** - Materials from whom a student gains skills, knowledge, and attitudes necessary for performing job tasks. They may include print and audiovisual materials of all kinds, equipment used in the occupation, computers, simulators, peers, instructors, individuals from the field or community, internships, group discussions, and lectures.

**Skill** - The ability to perform occupational tasks with a degree of proficiency within a given occupation. Skill is conceived of as a composite of three completely interdependent components: cognitive, affective, and psychomotor behavior. Skills tend to support the performance of many tasks.

**Step** - One of a series of procedures or activities that a worker does to complete a task. The completion of steps alone do not result in a meaningful unit of work.

**Task** - A work activity that is discrete, observable, performed within a limited period of time, and that leads to a product, service or decision. Tasks are also frequently referred to as the competencies that students or trainees must obtain in order to be successful workers.

**Task Analysis** - The process of analyzing each task to determine the steps involved, performance standards, tools, and equipment needed, related knowledge, safety, attitudes, and decisions expected of workers performing it.

**Task List** - A list of the duties and tasks performed by workers in a given occupation, usually verified (validated) by workers and/or immediate supervisors.
**Task Statement** - A description of a meaningful unit of work that contains an action verb, an object that receives the action, and usually one or more qualifiers, and represents a typical job assignment that an employer or customer would pay for.

**Verification** - The process of having experts review and confirm or refute the importance of the task (competency) statements identified through occupational analysis. Other questions such as the degree of task learning difficulty are also frequently asked. Reviewers are usually selected from the ranks of practicing workers and immediate supervisors of such workers. This process is also sometimes referred to as **validation**.