

# Curriculum Development & Assessment for Workforce Education Programs

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## **Background**

Community colleges are the core public institutions for education and skills training in the United States, with a total student population of 10.4 million. No other entity matches these schools' combination of scope and scale, typically a broad offering of basic skills, technical training, and traditional post-secondary education. Community colleges, moreover, are a long-term, stable presence in the community, open to all. Despite a failure in many instances to realize their potential as a bridge to higher-wage jobs, community colleges are a gateway to continuing and higher education, especially for economically disadvantaged individuals. Nearly 50 percent of all college students begin their education at community colleges.

For the purpose of this paper, *workforce education* is that form of pedagogy that is provided at the pre-baccalaureate level by educational institutions, by private business and industry, or by government-sponsored, community-based organizations where the objective is to increase individual opportunity in the labor market or to solve human performance problems in the workplace (Gray & Herr, 1998). Workforce education differs from general education in that the outcome goals of the latter are independent of employment.

President Bush in his 2004 State of the Union Address spoke of a new initiative to expand workforce training capacity at community colleges. In a statement responding to this initiative, the American Association of Community Colleges (AACC) enthusiastically endorsed it. If enacted, this proposal will help colleges meet the needs of individuals and businesses alike. AACC President George R. Boggs said, "President Bush's proposal addresses a pressing problem at exactly the right moment. Community colleges across the country are encouraged to know that the President embraces their essential role in helping workers gain needed skills. The highly positive reaction among members of Congress to the President's proposal was clear, and we hope that this initiative marks the beginning of a new federal commitment to community colleges and their role in promoting economic growth and individual prosperity."

According to a report released in April 2003 by the National Association of Manufacturing (NAM) (Machanic, 2003) a widespread loss of manufacturing jobs over the past two years has concealed a looming shortage of highly skilled employees. "Eighty percent of manufacturers report a serious shortage in qualified workers, even in the economic downturn," said Jerry Jasinowski, NMA president. Community colleges play a key role in not only educating future manufacturing employees, but in changing the industry's image as well.

Community colleges provide the broadest array of programs to deliver high-quality and cost-effective education to those who are unemployed, under-employed, or seeking to enhance their career prospects and quality of life. In addition, they play a leading role in meeting extreme labor shortages in such critical career areas as nursing and other health care professions, information technology, security and teaching. Industry leaders have indicated that community colleges are the most responsive postsecondary institutions, and, with average annual tuition of just \$1,905, they are also the most accessible.

The challenge to community colleges, therefore, is to anticipate what the job market will be, and what curricula must be developed to meet the training and retraining needs of the workforce. Community colleges must be able to develop and offer courses and programs in a rapid-response mode, an operating behavior not usually found on our campuses today. And they must become leaders in streamlining the process of developing, approving, and offering courses and programs in a manner that is relevant and responsive to the needs of their constituencies. In addition, faculty must be given every opportunity to remain current in their fields, while being allowed to develop new competencies and expertise.

Although the product of workforce education is instruction, the essence of this product is the content. Curriculum content is the knowledge that is to be developed by instruction. Content is the “what” of the who, what, when, and where questions addressed by a comprehensive curriculum. In workforce education, content takes three forms: cognitive (facts and concepts); psychomotor (manipulative occupational tasks), and interpersonal (work ethics). Determining and validating this content are major activities in the curriculum development process. It is a process that is mostly unique to workforce education; although the content of traditional academic courses is somewhat timeless, the content of workforce education courses is ever changing as technology and materials change in the workplace.

This report will discuss:

- Two curriculum design models
- Elaborate on two steps in the curriculum development process (task analysis and assessment)
- Define typical curriculum format
- Discuss two important curriculum design issues (career clusters and academic skills in postsecondary workforce education)
- Outline the LCC curriculum development model

### **Curriculum Design Models**

According to Gray and Herr (1998) two curriculum design models are prevalent in workforce education—competency-based education (CBE) and instructional systems design (ISD). CBE is most often associated with secondary and postsecondary workforce education, whereas ISD is associated with human resource development (HRD) in the private sector. The difference in the methods reflects the differing curriculum objectives in these two environments. The typical goal of CBE curriculum design is to provide labor market advantage to the individual whose status is that of student. The ISD model

begins with the assumption that there is a performance problem to be solved, but it may or may not be a training problem or one that will respond to instruction.

Both curriculum models can be referred to as performance-based education and, according to McNeil, 1996, have a five-step process.

I. Task Analysis. Task, or occupational, analysis is the term given to methodologies used to determine curriculum content.

II. Performance/learning objectives or outcomes. The purpose of task analysis is to enable the curriculum designer to write student performance objectives or outcomes. These objectives define the behavior and skills that must be demonstrated.

III. Developing instructional strategies. Once the performance objectives have been written, the next step is to design instruction to maximize the propensity of students to master the objectives. There are numerous instructional strategies that can be used including traditional delivery and innovative alternative delivery such as on-line options.

IV. Implementation. The next step in the CBE model is to implement the curriculum through the delivery of the courses. This involves curriculum management and student data management.

V. Evaluation/Assessment of Learning. The final step is assessment. The focus of assessment is on the effectiveness of the curriculum in achieving the institutional goals and the specific student performance objectives.

The two important steps that will be explored for this paper are:

- Task Analysis (I.)
- Evaluation/Assessment of Learning (V.)

### ***Task Analysis***

Task analysis is defined as steps taken to study an aspect of work in order to determine the “task” an individual needs to master to perform adequately on the job. Task analysis is the main methodology used for curriculum content determination in both CBE and ISD methods of workforce education instructional development. While there are several research designs or methods that are employed to conduct formal task analysis, there are three main approaches: (1) interviewing and/or surveying incumbent workers or occupational experts, (2) direct observation of workers on the job, and (3) the use of nationally developed skill standards. Elaboration on these three approaches follows.

### **Survey Methods—DACUM**

Because of cost and time considerations, the most widely used method of task analysis rely on sampling incumbent expert workers to develop and/or verify a list of duties, tasks, and steps associated with a particular occupation or field. Perhaps the most familiar of this type of methodology is the DACUM process originally developed by the Canadian

government. The term DACUM stands for “Develop A Curriculum” and employs a team of incumbent workers who are considered to be experts in an occupation. The group meets face to face, develops the duties and tasks, and then organizes them into a sequential instructional profile.

#### Observational Methods: Critical Incident Technique

The most elaborate form of task analysis involves actually observing incumbent workers do the job. One such method is called the critical incident technique. As the name implies, the intent is to determine what knowledge, psychomotor skills, and affective behaviors are critical to success by watching workers do their job. This technique is particularly useful in identifying interpersonal behavioral aspects of job performance or in solving unique human performance problems where only watching will reveal the key factors.

#### The Use of National Skill Standards

In the 1990s, skill standard initiatives at the federal level were spurred by the National Skills Standards Projects sponsored by the U.S. departments of Education and Labor and the establishment of the National Skill Standards Board in 1994. However, the standards movement in the USA includes more than 25 years of curriculum development by state curriculum centers and numerous curriculum projects and programs. One example of a long-term standards development group, the Vocational-Technical Education Consortium of States (V-TECS) has analyzed occupations since 1973, identifying tasks and standards that are used for vocational curriculum development by member and nonmember states.

Skill standards are generally associated with an industry or occupation, or some subset or combination of these. They have been, or are currently being, developed by industry, business, and labor organizations for specific occupations. Occupational areas with national skills standards ([www.nssb.org](http://www.nssb.org)) include

- Agriculture, Forestry, and Fishing
- Business and Administrative Services
- Construction
- Education and Training
- Finance and Insurance
- Health and Human Services
- Manufacturing, Installation and Repair
- Mining
- Public Administration, Legal and Protective Services
- Restaurants, Lodging, Hospitality and Tourism, and Amusement
- Retail trade, Wholesale Trade, Real Estate, and Personal Services
- Science and Technical Services
- Telecommunications, Computers, Arts and Entertainment, and Information Technology
- Transportation

- Utilities and Environmental
- Waste Management

Aligning curriculum to nationally developed skill standards makes sense in those content areas which have demonstrated high levels of validity for occupational success. Well-known examples of these types of standards include the National Institute for Automotive Service Excellence (ASE) standards for automotive technicians, the American Welding Society (AWS) standards for welds made by certified welders, and numerous apprenticeship standards. The National Fire Protection Association has also created national standards.

### ***Evaluation/Assessment of Learning***

In both the public and private setting, workforce educators typically are required to assess individual student or trainee performance in meeting the curriculum's learning objectives and communicate the result to multiple audiences. This task is often a professional challenge to both instructor and supervisor. In a CBE or ISD curriculum, assessment should be straightforward and noncontroversial; students either achieve mastery, as defined by the objectives, or they do not.

Problems in student assessment arise, however, because in many educational settings and in all credit or degree-granting institutions, letter grades (A,B,C) must be awarded. This grading seems inconsistent with the mastery learning or individualization implied in CBE or ISD, yet it is still the common practice. The unfortunate outcome has been inconsistent grading practices among faculty and the failure of some students to achieve critical competencies required for employment.

In the 1990s the concept of authentic assessment became popular among general education professionals. Considering that "authentic" means to demonstrate the application of knowledge, it seems fair to suggest that workforce education assessment has always been "authentic." The authentic assessment movement has created a tool that is of practical value to workforce educators, namely the use of rubrics to define, in detail, assessment that is associated with particular learning objectives. Goodrich (1996) defines a rubric as a "scoring tool that lists the criteria for assessing a piece of school work." A rubric can be useful in communicating to students how letter grades will be assigned to performance. Thus, a rubric defines quality and communicates definitions to students who then can become judges of their own performance.

### **Curriculum Format**

Typical examples of curriculum format include a course of study, curriculum guides, course outlines, and course syllabus (Duenk, 1993). These different types of documentation are not mutually exclusive.

A *course of study* typically states the objectives of the entire curriculum and outlines the sequencing of courses and modules that collectively make up the course or program. A college course catalog is an example of a course of study.

A *curriculum guide* is a detailed description of the curriculum for a particular course. It is the most detailed of all types of curriculum documentation including not just learning objectives or outcomes but often instructional design options and equipment requirements.

Curriculum guides organize program content in a number of different ways. The two most common are *units of instruction* and *modules of instruction*. The unit of instruction documents the instruction of a body of content and often relates to a set number of class sessions. Units are most often associated with group instruction. Learning modules are most often related to individual instruction and are designed to be self-contained learning packets that outline learning activities.

A *course outline* or *course syllabus* is typically the type of curriculum documentation provided to students or clients. A good course syllabus includes a course outline that lists the sequence of course content that will be addressed. In addition a course syllabus states student objectives, course requirements, methods of students' evaluation, and other information students or clients need to know regarding the course itself.

## **Discussion**

There are two important issues related to curriculum design at the community college level: (1) career clusters training versus in-depth, single-career training and (2) academic content in workforce education.

### **Career Clusters vs. In-depth Program**

A current debate in workforce education curriculum design is the question of depth versus breadth, or whether programs should be specific to an occupation or address a cluster of occupations. The issue involves a number of philosophical debates beginning with whether individuals are best served by (1) a program whose objectives are to provide maximum labor market flexibility by teaching job-entry skills in a variety of occupations, or (2) a program that stresses depth by teaching as many increasingly higher level skills in a single occupation as possible. Many parents, general educators, and the public endorse clustered programs because they offer students more flexibility in skill development and opportunities for advancement. Many employers like occupation-specific curriculum because it provides the in-depth skills they seek in their employees.

The State Directors of Vocational Education have funded the development of States' Career Clusters ([www.careerclusters.org](http://www.careerclusters.org)). A Career Cluster is a grouping of occupations and broad industries based on commonalities. They have defined 16 career clusters as an organizing tool for schools, small learning communities, academic and magnet schools. Partnerships involving state, schools, educators, employers, industry groups, and other stakeholders are creating curriculum guidelines, academic and technical standards, assessments, and professional development materials for these 16 career clusters:

1. Agriculture, Food and Natural Resources
2. Architecture & Construction

3. Arts, A/V Technology and Communications
4. Business, Management and Administration
5. Education & Training
6. Finance
7. Government & Public Administration
8. Health Science
9. Hospitality & Tourism
10. Human Services
11. Information Technology
12. Law, Public Safety & Security
13. Manufacturing
14. Marketing, Sales & Service
15. Science, Technology, Engineering & Mathematics
16. Transportation, Distribution & Logistics

### **Academic Skills**

Academic skills are traditionally defined as the skills of reading for comprehension, mathematics, science, and both writing and oral communication. These essential skills are always prominently mentioned in state and national workforce preparedness studies. Many researchers (Pucel, 1995; Stricht & Mikulecky, 1984), suggest that a much narrower subset is necessary for success in specific occupations, and these subsets differ according to occupation. While agreeing that sound basic academic skills are important and enable students to be independent self-learners, they contend it is far more likely that such skills are more important to success in training than on the job. In light of limited instructional time, they believe workforce education curriculum should be designed to “concentrate” on a subset of academic skills that are related to specific occupational or human performance problems.

Identifying a subset of appropriate academic skills related to an occupation or human performance problem requires task analysis. The importance of using task analysis to identify academic skills is suggested by the work of David Pucel (1995), confirming that for any particular occupation only a subset of academic skills is used regularly. Pucel studied the mathematics tasks and related mathematics skills required in two distinct occupations—secretary and electronics technicians. His research identified 34 different secretarial tasks that required mathematics, but only 17 out of a possible 63 mathematical operations were used to perform these tasks. Electronics technicians were found to do 45 different occupational tasks that required 38 mathematical operations. It is interesting to note that neither occupation included tasks that required all operations, and only 17 were common to both.

Community colleges are concerned about the inadequate basic academic skills of students enrolling in two-year postsecondary vocational and technical education programs. Given the technical nature of most secondary occupational programs, many students enrolling in college-level occupational courses lack adequate academic ability or skills. As a result, in most cases more than half must take remedial courses at the postsecondary level. It is

not uncommon to have 70 percent of the entering freshmen taking remedial education at a community college.

In particular, colleges need to develop formal bridge programs that (1) make remedial education more relevant to adults seeking career training and economic advancement, and (2) provide a direct transition to credit-bearing courses and career training. Courses that develop both basic academic and workplace skills help make developmental education more relevant to the job market and to the student. Under this approach, courses such as remedial English, reading and math incorporate materials from a specific field into the actual course content. Programs that promote contextualized learning make heavy use of projects, laboratories, simulations and other experiences that enable students to learn by doing. By integrating instruction in basic skills with instruction in technical content, contextual learning enables academically unprepared students to participate in career training as they enroll in basic education.

A similar argument can be made for general education courses taken by occupational students. These courses are made much more relevant for these students by teaching academic skills within an occupational context.

### **LCC Model**

About one year ago, LCC began implementing a new curriculum design model with the goal of moving occupational curriculum toward a more in-depth, skill-based, rapid-response model. The curriculum design process, outlined below, has been completed for some programs and is in progress for others. To maintain curriculum relevancy, the process will be repeated at various points in a program's life.

#### **Analyze Technical Content**

Using a DACUM approach, task analysis is conducted in the occupational areas with high employment potential for graduates. In other areas where appropriate, curriculum is adopted or aligned with national skill standards. To date DACUM's have been conducted in

#### **Manufacturing and Land Technologies**

- Civil Technology
- CADD
- Machine Trades
- Machine Maintenance

#### **Construction and Maintenance Technologies**

- Electrical
- Architecture
- Interior Design

#### **Visual Arts and Media Department**

- Photo Imaging Technology

National skills standards have been adopted in the welding and residential construction programs.

### **Analyze Academic Content**

A task analysis of academic content is conducted using national lists of academic curriculum related to workforce education.

### **Conduct Gap Analysis**

Technical and academic faculty study their task analyses to:

- (1) Identify if and where the task/element is currently taught within the existing curriculum
- (2) Identify content from the task analysis that is currently NOT taught and would either be incorporated into existing courses or created into new courses

### **Create Courses and Modularize Curriculum**

The content is sequenced and separated into courses. Each course is then separated into modules that can stand as independent units of instruction for business and industry use or taken in a normal sequence by traditional students for academic credit.

### **Create Common End of Course/Module Assessments**

An end-of-course written test of cognitive skills and performance (hands-on) assessments for each course and/or module is created. These assessments are used to evaluate student mastery and create an opportunity for dialogue among faculty members to improve their teaching and content.

This model can serve to:

- *Improve student recruitment and increase enrollment*, both by offering a new program directly aimed at providing good employment and by raising the profile of the college in the community.
- *Improve student retention and success* by providing an employer-defined, relevant curriculum for credit-bearing courses that lead to certification, academic degrees and career employment.
- *Raise the stature of the institution*, because the college becomes the natural place for business, government and community leaders to come together to increase the economic viability of the community or region.
- *Provide access to new funding* by expanding the college's ability to attract students and by building new relationships with employers and funding sources in the broader community and at the state level.
- *Improve the quality of education* by connecting programs and faculty from workforce and academic divisions. This approach can promote learning communities that bring together academic and vocational educators, offer new models for teaching, and help attract and retain talented, energetic and dedicated faculty members.

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