Chapter 12
Competence-based Education in the United States

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12.1 Introduction

Competence- or competency-based education in the United States has endured throughout the last 60 years, almost in spite of the periodic changes in leadership at the federal and state levels through the electoral process. This chapter provides an overview of the philosophical and practical underpinnings of competency-based education as is developed and expanded over the last century. From the work of philosopher John Dewey and the practical approach to education of Charles Prosser, the US education system has evolved into one of competence assessment and accountability. Major social and political events have had great influence on education and the development of competency-based education. The Industrial Revolution, labor force needs due to involvement in military conflicts, the Cold War, and the threat of being left behind in the space race contributed immensely in determining how changes in education must occur to ensure that the education system responds to the needs of the country and its citizenry. Legislation at federal and state levels continues to strengthen commitment and authority, but the basis for those programs continues to be identifying, delivering, and assessing competency-based education.

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12.2   Foundations for Competency-Based Education

Competency-based education is as old as education itself. In fact, some writers have quipped that no one would ever knowingly plan an educational program that is incompetence based. Formal education in the United States prior to the twentieth century occurred mainly in schools of less than 12th grade, and education beyond high school was often attained only by the wealthy through sending their children to Europe to study the classics, religion, law, or music. The children of the common people developed skills and trades through work in the home, on the farm, or in some small business. While developing competencies that were perhaps enduring, these opportunities were not planned or organized into a schema that provided for the development of competence in a particular skill area.

Much of the educational philosophy underpinnings of the competency-based movement in the United States can probably be traced to John Dewey. Kimpton (1959) wrote of Dewey's early work that became known as progressive education, a term that brought on substantial debate. Nonetheless, as Kimpton reports, Dewey was concerned with the problem of how people think and proposed that all thinking begins with a problem, perplexity, or felt need and ends within a context that shapes thinking and determines the relevance of the conclusion (problem, perplexity resolved, felt need addressed) (Dewey 1997).

Dewey further argued that what is experienced is real (Evans 2000), charting the course for a new look at experience in education and experiential learning. Dewey maintained that all experience is educational but not all education is experiential (Dewey 1897). While on the faculty at the University of Chicago, Dewey developed an experimental elementary school. Children were involved in work and experiences related to such occupations as shop work, cooking and sewing, and gardening (Lakes 1985). Dewey believed that these experiences would help children in developing an understanding of the science and processes of work and to learn to solve problems. Stemming from his belief that the education system needed massive change, Dewey believed that vocational education was the means to bring about that change (Gordon 2008).

During this same time period, Charles Prosser, a graduate of Columbia University and student of David Snedden, served as Deputy Commissioner of Education for the State of Massachusetts and then as Executive Director of the National Society for the Promotion of Industrial Education (NSPIE) (Gordon 2008). The need for better and more extensive occupational training had become evident, primarily as the result of the Industrial Revolution. But unlike Dewey, Charles Prosser promoted the concept that vocational education must combine two facets: practice and thinking about practice and doing and thinking about doing. The main thrust was on the practice and doing, for Prosser believed that learning skills must occur in a situation as close to the reality of the workplace as possible. Prosser's 16 theorems, and his role with the NSPIE, led to his primary participation in writing the National Vocational Education Act of 1917, which was clearly more "vocational" than Dewey would have proposed.

Gordon ([2008](#)) summarized Prosser's work and modern times in vocational education by enumerating workplace competencies and foundational skills, emphasizing "school today for skills tomorrow" (p. 28).

Workplace Competencies

   Resources: how to allocate time, money, materials, space, and staff
   Interpersonal skills: how to work on teams, teach others, serve customers, lead, negotiate, and work well with people from diverse cultural backgrounds
   Information: how to acquire and evaluate data, organize and maintain files, interpret and communicate, and use computers to process information
   Systems: understand social, organizational, and technological systems; how to monitor and correct performance; know how to design or improve systems
   Technology: how to select equipment and tools, apply techniques to specific tasks, and maintain and troubleshoot equipment

Foundational Skills

   Basic skills: reading, writing, arithmetic, mathematics, speaking, and listening
   Thinking skills: ability to learn, to reason, to think creatively, to make decisions, and to solve problems
   Personal qualities: individual responsibilities, self-esteem and self-management, sociability, and integrity (p. 28)

Those competencies and skills could serve as the basis for modern-day competency-based education.

Vocational education, however, whether under the philosophy of Dewey or Prosser, is not necessarily competency-based education. With the advent of a dual system of education that separated "academic" and "vocational" education, as Prosser proposed, one of Dewey's major concerns surfaced (Gordon [2008](#)). Dewey argued that separating trade education from general education would tend to make both forms narrower, less significant, and less effective (Dewey [1915](#)).

In summary, Prosser clearly advocated job-skill development which can be viewed as a precursor to the competency-based education movement. Dewey worried that such education would lead to the status quo, limiting rather than transforming industrial society.

12.3 Behaviorism and Competence

The concepts and practices of competency-based education and training in the United States are deeply rooted on the theory of behaviorism. Since behaviorism focuses on the measurable activities of the learner, education and training following the behavioristic model means bringing about a change in behavior. Therefore, the way to understand humans is through observing their behavior (Wang [2011](#)).

Behaviorism is not anti-Dewey in philosophy, since Dewey believed that experiences drive education. Further, various writings by B. F. Skinner ([1968](#))

emphasized that learner behavior can be directed and redirected and can be controlled through positive reinforcement and individual differences can be addressed.

Behaviorism in the context of competency-based education and assessment relies on three components. These include:

1. The conditions under which the activity is to be performed
2. The behavior that is to be performed
3. The criteria by which the behavior will be evaluated as acceptable/unacceptable or successful/unsuccessful (Wang 2011)

The goal in behaviorism is to assess the learning outcomes as objectively and accurately as possible in order to show how much progress is being made and, perhaps, what additional learning needs to occur.

Ellias and Merriam (2005) indicated several advantages of applying behavioristic principles to occupational learning. They include:

1. Allowing for individual differences in terms of starting points for instruction
2. Providing flexible time in allowing students to achieve mastery
3. Learning in a variety of conditions and settings
4. Using criterion-referenced rather than norm-referenced assessments
5. Encouraging self-direction for individual experiences

Of course, as in any approach to teaching, learning, and training, the authors also admit to some potential disadvantages:

1. The behavioristic approach requires accurate identification of tasks to be completed.
2. Some competencies may be difficult to specify and therefore difficult to perform and assess.
3. Minimum performance standards for assessment of learning may be difficult to establish.
4. The end product is predetermined, perhaps limiting creativity.
5. The curriculum may become fragmented.

But despite both advantages and disadvantages, behaviorism has provided a solid theoretical background for competency-based education.

Benjamin Bloom (1956) with colleagues at the University of Chicago defined and expanded upon work of earlier education philosophers in describing the cognitive domain of learning. Bloom's work, although occasionally "updated" by more recent authors, has stood the test of time in establishing a framework for behavioristic cognition. In the cognitive domain, six levels of hierarchy have been established to show increasingly complex but not necessarily increasingly important levels of behavior: knowledge, comprehension, application, analysis, synthesis, and evaluation. The work of Bloom is frequently associated with writing instructional objectives that include the essential components as defined by Skinner (1968): conditions, performance, and criteria.

Later, Mager (1984) continued the work of Bloom in providing guidance for writing instructional objectives in a behaviorist mode. His work is credited with promoting behavioral objectives in education and training.

Behaviorism centers on learner activity that can be seen, practiced, and assessed. Although the term competence came into vogue later, it can be observed that the works in behaviorism served as a basis for competency development and competency-based educational practice. The theory of behaviorism was a strong influence on the development of competency-based education, with the emphasis on expressing competencies in behavioral terms and on assessment of observable behaviors (Hodge 2007).

Hodge also discussed systems theory as a basis for the development of competency-based education. First, training is seen as a subsystem to the broader complex such as industry. As a corollary, training can be viewed as an independent or individual system, leading to what can be construed as the ideal model for training (Hodge 2007).

Behaviorism and competence development has also been linked to behavior modification. While Skinner (1968) used that term more narrowly, more recent uses are more positive in approach. Behavior modification is a method of eliciting better classroom performance from reluctant students. It has six basic components:

1. Specification of the desired outcome (what must be changed and how it will be evaluated)
2. Development of a positive, nurturing environment (by removing negative stimuli from the learning environment)
3. Identification and use of appropriate intrinsic and extrinsic rewards
4. Reinforcement of behavior patterns that develop until the student has established a pattern of success in engaging in class discussions
5. Reduction in the frequency of rewards—a gradual decrease in the amount of one-on-one review with the student before class discussion
6. Evaluation and assessment of the effectiveness of the approach based on teacher expectations and student results (Brewer et al. 2000)

Taken literally, behavior modification takes on an aura of negativity. A criticism of behaviorism is that student creativity is stifled and that teaching is too instructor focused. Newer "theories" such as constructivism appear to address those concerns; however, it should be noted that the end result of a constructivist approach to teaching, for example, is still behavior change. The learner, as a result of successfully developing competence, can do, think, and appreciate a phenomenon differently. Behavior was changed.

12.4   US Education Movements in the Twentieth Century

Early in the twentieth century, the US populace was faced with the need to address issues in public education (Calhoun and Finch 1976). Rapid developments in industry, the need to feed more people, and the migration from rural to urban areas called for a transformation in thinking and practice regarding public education. As schools developed (expanding to include high schools and firmly establishing public universities), citizens were torn between keeping the federal government out of local

concerns and wanting the federal government to provide a high-quality education, or at least an opportunity for such, for all citizens. Secondary school education was not mandatory, there was little motivation for children to remain in school, and therefore little was being done to help children learn necessary skills required to be successful in the agro-industrial complex. Such a failure of schools led to a substantially unproductive and underproductive society (Calhoun and Finch 1976).

The National Society for the Promotion of Industrial Education (NSPIE), which Charles Prosser helped found, was essentially created to address the issues of education in an Industrial Revolution United States (Barlow 1974). The Society was successful in encouraging the federal government to establish the Commission on Vocational Education in 1914, with the purpose of creating a report on the status of vocational education (Hawkins et al. 1966). Prosser was also instrumental in crafting early legislation regarding vocational education, and the NSPIE later became the American Vocational Association and now the Association for Career and Technical Education.

The movement toward education related to industries and toward skill development grew during the early twentieth century as a result of various societies and commissions in the states. Manual training in agriculture and home economics had been introduced into many schools, but instruction lacked a vocational or competency focus (True 1929). The demand for a more definitive type of industrial education arose, and the movement evolved into the broader arena of industrial education.

Legislation that authorized and appropriated funds for vocational education and training had been proposed in various forms, but eventually the US Congress passed and President Woodrow Wilson signed the National Vocational Education Act of 1917, more commonly referred to as the Smith-Hughes Act (proposed by Senator Smith and Representative Hughes of the State of Georgia). The Act provided for instruction in agriculture, home economics, and trades and industries, called for a federal board for planning and oversight, and provided for state-level leadership and teacher preparation (True 1929).

Additional legislation by the US Congress addressed specific aspects of the initial 1917 legislation. But the major tenets of the creation of vocational and technical education endured for decades and served as a grounding point for later developments in competency-based education.

12.5   War, Recession, the Military, and Sputnik

The involvement in World War I by the United States created immediate demand for trained workers in a broad array of industries. Supplying the military with mechanics and technicians required quick and intensive training. In addition, with millions of men leaving work to serve their country, additional demand was placed on other industries to fill the void. All of this had an enormous impact on training, and the US government and people began to develop a better and stronger appreciation for technical training (Thompson 1973).

Dominant among social issues related to workforce development was the Great Depression, extending from late 1929 through most of the 1930s, with a large effect on youth employment as well as adult's. Enormous unemployment rates meant that employers could hire experienced adults rather than youth who had no training and no work experience (Evans 1971). As a result, the federal government passed legislation to address the training needs of youth. Programs such as the National Youth Administration and the Civilian Conservation Corps helped unemployed young men prepare for and find suitable employment (Calhoun and Finch 1976).

World War II created even more pressure on the workforce in the United States and on training programs, both within and outside of the military. By then, vocational training was much more prevalent, and the government could concentrate more on expanding existing programs rather than creating and funding new programs (Thompson 1973). Likewise, military and industrial needs were more defined as a result of the growth and expansion of industrial technology, so the concept of training a worker for a specific set of observable and measurable skills was becoming commonplace.

Jobs were plentiful during the period of US involvement in World War II, and the demand for well-trained workers was enormous. But the aftermath of the war created an even greater challenge for employment and training. Military personnel returning from the war needed jobs and needed training (Thompson 1973). While many chose to enter or return to higher education, many thousands of others needed a job and did not have the time or the money to spend months or years in preparing for the workforce.

The Cold War period of the 1950s and 1960s, with tensions between the United States and the former USSR, created a demand for more of a systems approach to skill training (Hodge 2007). War had created a need to specific and usually short-term training for becoming competent in a specific set of tasks. The postwar emphasis shifted to viewing skill development within larger and more complex systems calling for the interface between man and machine, with human development as one component of the larger system. Thus, competency training could be subdivided into the separate and specific problems as identified by Kennedy (1962): individual training, environmental supports, team training, and system training. The Manpower Development and Training Act of 1962 further recognized the need for fiscal programs that are geographically selective to help maintain national economic activity (Bachmura 1963). The legislation authorized programs for people whose skills were rendered obsolete and for new entrants to the workforce who needed further education to meet employment needs.

The launch of Sputnik in 1957 prompted a much stronger federal role in education. The fear that the USSR was outpacing the United States academically created a fury of legislation in order to help ensure the security of the nation (Elam 1971). Two decades of federal intervention led to massive increases in funding and subsequent legislation including the Vocational Education Act in 1963 and the Elementary and Secondary Education Act of 1965. Indirectly, all of this activity gave economic support to the development of competency-based education.

12.6   Outcome-based Education

The outcome-based education (OBE) movement was promoted as a model for restructuring education, moving the measurement of education progress from inputs to outcomes. Spady (1988) is often credited with being a developer and certainly an advocate of OBE, arguing that the traditional approach to education favored administrative convenience over student mastery (McNeir 1993). He also noted that OBE is prevalent throughout the world in a variety of models, dating back to the craft guilds of the Middle Ages. Spady (1994) defined OBE as a comprehensive approach to organizing and operating education systems focused on successful demonstrations of learning. Outcomes are learning results for students to demonstrate and performances that reflect learner competence in using what they have learned. Spady argued that OBE must be based on four principles:

1. Clarity of focus on outcomes of significance, making sure to continuously align instruction and assessments with the desired end state
2. Designing down from the ultimate outcomes, working back from the desired end state and establishing the resources and skills needed to achieve the desired state
3. High expectations for high levels of success, achieving a greater level of success for each student and eliminating the idea that some students cannot achieve that success
4. Expanded opportunities and support, recognizing that time is the most critical resource that enables students to achieve goals rather than a constraint on educational process (Gardner 1983)

Advocates of OBE generally agreed that standards and expectations will rise because the emphasis focuses on the learner and what can be achieved.

Spellings (2008) consolidated the thinking of OBE scholars in a comparison of what was termed the "traditional education model" and the outcome-based or "transformational" model.

Traditional education model	Outcome-based model (Transformational model)
Inputs such as number of books and computers available, student/teacher ration	Engender the competent citizen prepared for the challenges of the future
Courses academically structured and designed around hours available to teach	The outcome or result is most important
All students move through the subject material as a cohort group at the same pace	Outcomes are developed first; the course is structured with flexible time, resources, and space
Teachers are given specific subjects they prepare for and teach and then evaluate students	Learners move through the subject material at their own pace using methods that suit their style
Evaluation criteria are based on tests and/or papers graded by the teacher	Teachers have a holistic role, responsible for outcomes related to the course
Learners amass enough classes over a specific period of time, leading to a credential awarded by a governing body	Learners demonstrate mastery of material through practical application such as projects, products, and performances

Spady (1988) further dichotomized traditional methods and OBE, indicating that traditional methods are ineffective and perhaps detrimental to learning. A teacher covers a given amount of content in a given amount of time and then assumes that learning has occurred. When time is the constant, learning becomes the variable.

McNeir (1993) recognized that implementing OBE in school settings (and probably in the industry as well) is challenging and requires change throughout the system. Her observation was that OBE often was not fully implemented into a systems approach to reform, but rather the OBE philosophy was merely superimposed onto an existing curriculum and school goals dictated by legislative requirements. Further, additional challenges are presented once OBE is implemented, including the difficulty in writing exit outcomes, balancing OBE process with content, and creating new methods of assessing learning.

Where complete implementation of OBE has occurred in school systems, the challenges have been addressed. Fitzpatrick (1991) described the work in one school district that adopted OBE. The first step was to envision the skills and knowledge needed by students, leading to proposed outcomes:

- Ability to communicate
- Facility in social interaction
- Analytic capabilities
- Problem-solving skills
- Skill in making judgments and decisions
- Skill in creative expression and response to creative work of others
- Civic responsibility
- Responsible participation in a global environment
- Skill in developing and maintaining wellness
- Skill in using technology
- Skill in life and career planning

Based on these proposed outcomes, the curriculum framework was created with flexibility in which credits and the number of courses vary with students. As a result, students should be able to demonstrate the ability to:

- Employ observation skills
- Classify and organize information
- Draw and support inferences
- Describe and define relationships
- Integrate and apply these skills in a variety of situations (Fitzpatrick 1991)

More recent work in instructional design labels the process "backward design" or beginning with the end in mind (Wiggins and McTighe 2006). While the term "backwash effect" may also be used, that process is often associated with "teaching to the test" which has negative connotations in an era of standardized testing. Backward design, according to Wiggins and McTighe, is more closely associated with identifying outcomes and competencies to be achieved or developed and then creating a learning environment to bring about success in competency development. Those authors promote the concept that the three steps in instructional design

include identifying desired results, determining acceptable evidence, and planning learning experiences and instruction.

Outcome-based education, then, is clearly rooted in the philosophy and practice of noted education leaders. Tyler (1949) identified the fundamental issues of developing and planning instruction, including purpose, content, organization, and evaluation. He firmly believed that objectives were essential for systematic planning and identifying desired learner outcomes. His work coupled with the taxonomy of educational objectives prescribed by Bloom (1956), discussed earlier in this chapter. And the concept that learner outcomes are more than a simple skill development (although technical skills are important) derives from the Dewey philosophy combined with the pragmatic approach of Prosser.

Of course, there were and are detractors. McKernan (1993) began with questioning the underlying assumptions of OBE, asserting that teaching with a specific outcome in mind contradicts the notion that education is an induction into knowledge and denies the possibility that the education experience (acquiring knowledge) is valuable in and of itself. He further raised concerns that OBE mirrors behavioral modification, and stating specific outcomes implies that external testing is the only way to determine whether those objectives have been met.

McKernan offers his own alternative to OBE, a "procedural inquiry model" which contains three components. First is the broad aim of advancing understanding. The second is based on the assertion that discussion is the best teaching strategy for meeting this aim and the teacher is a facilitator who remains neutral on values issues. And third, the model includes criteria for assessing performance, including how well learners use concepts and knowledge to explore new ideas. Reflection on McKernan's discussion and model provides insight regarding how his objections and proposed model probably fit well into Spelling's (2008) transformational model, actually not differing significantly from the rich underpinnings of OBE.

The move toward outcome-based education was in part in response to concerns that the US education system cannot adequately prepare students for life and work in the twenty-first century (Education Commission of the States (ECS) 1995). Educators and policy makers in several states have attempted to change the way education effectiveness is measured from an emphasis on traditional inputs, such as course credits earned and hours spent in class, to results or outcomes. Further, a competency-based education system also takes into account the student's prior learning, although that premise is not widely accepted in higher education (Harris et al. 2011). This change mirrors the total quality movement in business and manufacturing and reflects a belief that the best way for individuals and organizations to get where they want to go is first to determine where they are and where they want to be and then plan backward to determine the best way to get from here to there.

Proponents of OBE assume there are many ways to arrive at the same results; the important thing is that states, districts, schools, and students do achieve them. Opponents worry about who will decide on outcomes and how students, schools,

and districts will be held accountable for achieving them. Both sides raise fundamental questions about the structure and direction of the education system and the role of education in a democracy (ECS 1995).

Debate about OBE reveals widespread confusion about terminology and concepts. The term "outcomes," "standards," and "goals" frequently are used interchangeably, and individuals disagree about their meanings and applications. And those terms are used interchangeably to refer to different types of results, including content outcomes, student performance outcomes, and school performance standards. *Content outcomes* describe what students should know and be able to do in particular subject areas. *Student performance outcomes* describe how and at what level students must demonstrate such knowledge and skills. *School performance standards* define the quality of education schools must provide in order for students to meet content and/or performance outcomes (ECS 1995).

The 1995 report from the ECS also provided an overview of arguments in favor of and against OBE.

Common arguments in favor of OBE	Common arguments against OBE
Promotes high expectations and greater learning for all students	Conflicts with admission requirements and practices of most colleges, which rely on credit hours and standardized test scores
Prepares students for life and work in the twenty-first century	Some outcomes focus too much on feelings, values, attitudes, and beliefs and not enough on attainment of factual knowledge
Fosters more authentic forms of assessment	Relies on subjective evaluation rather than objective tests and measurements
Encourages decision-making regarding curriculum, teaching methods, school structure, and management	Undermines local control

Coinciding with outcome-based education, occupational analysis stems from determining the one best way to do a job. Occupational analysis begins with task analysis, including procedural tasks and information processing tasks. Procedural task analysis involves breaking tasks into steps or procedures that workers perform to complete the task (Wang 2011). Procedural task analysis is driven by the philosophy of behaviorism, focusing on observable and measurable behaviors. Similarly, information processing tasks account for the intellectual skills that are requisite in completing the work. Occupational analysis leads to competency-based education and training.

Outcome-based education can be regarded as a theory or philosophy of education (Killen 2000). That theory provides a set of beliefs and assumptions about learning, about teaching, and about systemic structures to form a basis for outcome-based and competency-based education.

12.7 Competency-Based Education

Competency-based education (CBE) was introduced in the United States in the 1960s in reaction to public concern that students were not being taught the skills needed for success in life, in reaction to international issues on competition including the "space race" after Sputnik, and in addressing legislation at the federal and state levels as noted earlier. Public dissatisfaction with schools and the public perception of teacher incompetence were driving forces (Ross 1982; Rossner and Kay 1974). Rossner and Kay further contended that CBE resulted also from demands for accountability, relevance, and cost-effective schooling. A CBE approach was seen by many educators as a means to satisfy the demand for accountability in the schools. Various authors asserted that CBE would assure that students would learn the skills needed to become successful members of the workforce and society, that students would learn more and at a faster rate, and that CBE was inexpensive to implement (Rockler 1979; Allen 1981; McGowan 1981; Vincent and Cobb 1977).

Norton et al. (1978) also pointed out an important stimulus for the development of CBE in the US dropout rates in secondary schools, and difficulties in finding jobs for graduates in the 1960s led to the creation of a national panel to review vocational education legislation and programs. The report led to the Vocational Education Act in 1963, mentioned earlier, which altered the concept of work and funded the development of job training institutions. Obviously, these actions had significant impact on the preparation of teachers to work in environments that could lead to greater successes in competency-based programs.

A variety of definitions exist for CBE. Most models include these elements:

- Performance based.
- Responsive to individual needs.
- Flexible timeframe to achieve mastery.
- Provisions for immediate feedback.
- Based upon task analyses.
- Containing measurable objectives.
- Variety of instructional activities.
- Explicit learning outcomes.
- Criterion-referenced assessment.
- The learner is accountable for personal achievement (Buttram, Kershner, Rioux, and Dusewicz 1985; Malan 2000).

More recently, Wesselink et al. (2007) reported eight principles of competence-based education derived from a focus group and Delphi study involving Dutch researchers. The eight principles include (see the chapter of Wesselink et al. (Chap. 25) in this volume for an elaboration of these principles):

- Competencies that are the basis for the study program are defined.
- Vocational core problems are the organizing unit for designing the curriculum.
- Competence development of students is assessed before, during, and after the learning process.

- Learning activities take place in different authentic situations.
- In learning and assessment processes, knowledge, skills, and attitudes are integrated.
- Self-responsibility and self-reflection of students are stimulated.
- Teachers in both school and practice fulfill their role as coach and expert in balance.
- A basis is realized for a lifelong learning attitude for students.

Competency-based education in the United States also correlates with the mastery learning movement (Soares 2012). A model of mastery learning was first theorized by Carroll (1963). His concern was that the current system of instruction nurtured the achievement of only a small number of students. In order to improve effectiveness, Carroll developed his model of school learning, a mathematical-oriented model that asserts that a learner will succeed in learning to the extent the learner spends the time needed to learn the task. Factors associated with the model included the learner (aptitude, time needed to learn under ideal instruction, ability to understand instruction, perseverance) and external conditions (time allowed for learning, quality of instruction). Achievement could be traced to the combination of these conditions, so maximizing time allowed and improving instruction would address individual needs and result in higher rates of success.

Logically, mastery learning should be the basis for all of education. However, in a highly structured system, whether in schools or industry, time is not flexible. Improvements in instruction, assuming that attention is given to assessing needs and providing development of techniques, cannot be totally accountable for improvement in student learning. Mastery learning addresses the key concepts of competency-based education; administrators need to make an effort to solve the "flexible time" component.

Two additional issues must be discussed regarding the advent of CBE in the United States. Those are assessment and accountability, which are highly interwoven.

Glaser (1962; 1994) provided much-needed guidance in terms of assessment measures for training programs and other competency-based programs. Norm-referenced assessments are those that measure a student's performance against the performance of other students. Such an assessment provides information about how the student compares to the norm but does little to reflect how the student performed in relation to the content to be learned. Norm-referenced measures can say a lot about a group but very little about an individual; individual student assessment is based on relativity, which is hardly relevant in the real world. However, norm-referenced assessments are the basis for standardized tests including state-mandated assessment tests and college entrance tests.

Criterion-referenced assessments indicate whether the student has learned the behaviors as identified in the curriculum and objectives. A concern is that the assessment could evolve into "yes or no" regarding whether the learner has achieved the desirable behavior. Various methods are used to address the concern, primarily that

of establishing a minimum level of accomplishment (such as 90 % accuracy) for declaring competence (Malan 2000).

For trainers and instructional designers, criterion-referenced assessments can provide valuable insight into the success of a given education/training program and help chart the course for additional development activities.

In the United States, competency-based education has been embraced more by human resources departments (staff development, personnel management and training) and in adult education than in the school system. Several factors are associated with those differences.

First, industry has much greater flexibility in designing and offering CBE programs for employees. Further, industry can require participation (and passing scores) of employees as a requirement for continued employment and advancement. Human resources can offer programs for any amount of time, and employees can be given the flexibility to spend the time necessary to master the content, practice the new behaviors, and show competence to supervisors. The military model is perhaps the most evident. Competency-based training is provided for a select set of enrollees who study and practice a finite set of skills until the required level of achievement is reached. To the extreme, no one would want military personnel protecting the country with only partial knowledge because the trainees ran out of time before learning the skills.

Adult education, such as through the federally and state-funded cooperative extension service and community colleges, is also a prime location for CBE. Adult learners are more mature, are clearer in identifying their needs, and are willing to spend adequate time (but no more, in most cases) in achieving their learning goals. Their interest in obtaining mastery rather than a grade adds to their ability to achieve in a CBE setting.

Within a school classroom or within a unit of instruction within a class, CBE can be highly effective through taking advantage of opportunities for flexible learning time. Especially in primary grades, students are already grouped by ability level. As they are provided content to be mastered, each group and each student within a group can progress at a unique rate. Once a skill is mastered or a behavior is successfully demonstrated, the learner can progress to the next level.

Why is CBE not fully integrated into the academic setting? The answer is relatively simple. The US education system is still based on an agrarian society where the children needed to be released from school in the summer to help on the farm. The 9-month school year mentality is still pervasive. Likewise, the 13-year system is based on groups of students progressing from one grade level to the next after about 36 weeks of instruction, regardless of whether any or all of the students achieved full mastery of the content. A passing grade is license to pass to the next grade level. And in higher education, achievement is measured more by "seat time" than by development and mastery of competence (CIC 2015), which is measured by credit hours. However, educators continue to emphasize student learning outcomes as intended measures of competence (Klein-Collins 2013). Competency-based

education in higher education seems to be more popular among older, place-bound students with significant work experience, probably related to online programs being focused more on competency development approaches (Kelchen 2015; Klein-Collins 2012).

More recent legislation such as *No Child Left Behind* (USDE 2002), *Race to the Top* (USDE 2009), and *Every Student Succeeds* (USDE, 2015), which are actually extensions of the Elementary and Secondary Education Act, purportedly address accountability. Schools must be able to show how students are achieving at rates acceptable to a set of standards. The Common Core (USDE 2009) movement, at federal and state levels, is also designed to ensure accountability that schools are doing what they are funded to do and that therefore students are learning what they are supposed to learn. However, the utilization of high-stakes testing to decide whether schools and learners are achieving the intended outcomes has proven to be less than adequate and less than ideal. It could be concluded, then, that if competency-based education were fully implemented in the public school system, embracing all of the elements in a CBE model, students would learn more and schools would be more accountable.

In the United States, career and technical education address CBE more closely than any other facet of the school system. A modern-day derivative of vocational education, career, and technical education embraces the tenets of competency-based education. The combination of classroom instruction in academic and technical areas with hands-on activities in laboratories and on-the-job training provides opportunity to address the behaviors identified through occupational analysis for all students and in all academic and technical areas.

12.8   Conclusions

Competency-based education is alive and well in the United States. Reauthorization of legislation such as the Elementary and Secondary Education Act on a periodic basis, especially during changes in federal administration, continues to address how the public school system can plan for and meet the needs of all students. The debate continues regarding whether CBE is the right response; nevertheless, federal and state programs continue to authorize, mandate, and to some extent fund the careful analysis of what skills and competencies are needed and how student progress should be assessed.

After 100 years, the philosophy of Dewey in terms of educating the "whole person," coupled with the work of others such as Prosser, who viewed competency development more narrowly, continues to be the basis for public education. While the mandates and restrictions are considerably less at the post-high school levels, even higher education continues to grapple with identifying the competencies needed for graduates to be successful and to be productive workers and citizens.

References

Allen, K. R. (1981, June). An effective measurement of performance. *VocEd, 56*, 39–40.

Bachmura, F. T. (1963). The manpower development and training act of 1962—its significance for rural areas. *Journal of Farm Economics, 45*(1), 61–72.

Barlow, M. L. (Ed.). (1974). *The philosophy for quality vocational education programs*. Washington, DC: American Vocational Association.

Bloom, B. S. (Ed.). (1956). *Taxonomy of educational objectives. Handbook I: Cognitive domain*. New York: David McKay.

Brewer, E. W., Campbell, A. C., & Petty, G. C. (2000). *Foundations of workforce education: Historical, philosophical, and theoretical applications*. Dubuque: Kendall/Hunt Publishers.

Buttram, J. L., Kershner, K. M., Rioux, S., & Dusewicz, R. A. (1985). *Evaluation of competency-based vocational education. Final report*. Harrisburg: Pennsylvania State Department of Education.

Calhoun, C. C., & Finch, A. V. (1976). *Vocational and career education: Concepts and operations*. Belmont: Wadsworth.

Carroll, J. B. (1962). A model of school learning. *Teachers College Record, 64*, 723–733.

Council of Independent Colleges. (2015, April). *Competency-based education*. Washington, DC: Author.

Dewey, J. (1897). My pedagogic creed. *The School Journal, 54*(3), 77–80.

Dewey, J. (1915). Education vs. training. *The New Republic, 28*, 42.

Dewey, J. (1997). *Experience and education* (Reprinted from the original, 1938 © Kappa Delta Pi). New York: Touchstone.

Education Commission of the States. (1995). *Outcome-based education: An overview*. Denver: Author.

Elam, S. (1971). *Performance-based teacher education. What is the state of the art?* Washington, DC: American Association of Colleges for Teacher Education.

Ellias, J. L., & Merriam, S. B. (2005). *Philosophical foundations of adult education*. Malabar: Krieger.

Evans, R. E. (1971). *Foundations of vocational education*. Columbus: Charles E. Merrill.

Evans, K. G. (2000). Reclaiming John Dewey: Democracy, inquiry, pragmatism, and public management. *Administration and Society, 32*(3), 308–328.

Fitzpatrick, K. A. (1991, May). Restructuring to achieve outcomes of significance for all students. *Educational Leadership, 48*(8), 18–22.

Gardner, D. (1983). *A nation at risk*. Washington, DC: U. S. Department of Education.

Glaser, R. (Ed.). (1962). *Training research and education*. Pittsburgh: University of Pittsburgh Press.

Glaser, R. (1994). Instructional technology and the measurement of learning outcomes: Some questions. *Educational Measurement: Issues and Practice, 13*(4), 6–8.

Gordon, H. R. D. (2008). *The history and growth of career and technical education in America* (3rd ed.). Long Grove: Waveland.

Harris, J., Breier, M., & Wihak, C. (2011). *Researching the recognition of prior learning*. Leicester: National Institute of Adult Continuing Education.

Hawkins, L. S., Prosser, C. A., & Wright, J. C. (1966). *Development of federal legislation for vocational education*. Chicago: American Technical Society.

Hodge, S. (2007, July). The origins of competency-based training. *Australian Journal of Adult Learning, 47*(2), 179–209.

Kelchen, R. (2015, January). *The landscape of competency-based education*. Washington, DC: Center on Higher Education Reform.

Kennedy, J. L. (1962). Psychology and system development. In R. M. Gagné (Ed.), *Psychological principles in system development*. New York: Holt, Rinehart and Winston.

Killen, R. (2000). *Outcomes-based education: Principles and possibilities*. Unpublished manuscript, University of Newcastle, Australia.

Kimpton, L. A. (1959, Summer). Dewey and progressive education. *The School Review, 67*(2), 125–127.

Klein-Collins, R. (2012). *Competency-based degree programs in the U.S*. Chicago: Council for Adult and Experiential Learning.

Klein-Collins, R. (2013, November). *Sharpening our focus on learning: The rise of competency-based approaches to degree completion*. Champaign: National Institute for Learning Outcomes Assessment.

Lakes, R. D. (1985). John Dewey's theory of occupations: Vocational education envisioned. *Journal of Vocational and Technical Education, 2*(1), 41–45.

Mager, R. F. (1984). *Preparing instructional objectives* (2nd ed.). Belmont: David S. Lake.

Malan, S. P. T. (2000). The 'new paradigm' of outcomes-based education in perspective. *Journal of Family Ecology and Consumer Sciences, 28*, 22–28.

McGowan, J. H. (1981, May). Producing employable students through competency-based education. *Business Education Forum, 35*(8), 28–30.

McKernan, J. (1993, Summer). Perspectives and imperatives: Some limitations of outcome-based education. *Journal of Supervision and Instruction, 8*(4), 343–353.

McNeir, G. (1993, Fall). Outcomes-based education. *Research Roundup, 10*(1), 2–5. Alexandria: National Association of Elementary School Principals.

Norton, R. E., Harrington, L. G., & Gill, J. (1978). *Performance-based teacher education: The state of the art*. Athens: American Association for Vocational Instructional Materials.

Rockler, M. J. (1979, December). Competency & creativity—Can we do both? *Curriculum Review, 18*, 366–370.

Ross, D. (1982). Competency based education: Understanding a political movement. *Educational Forum, 46*, 483–490.

Rossner, B., & Kay, P. (1974). Will the promise of C/BTE be fulfilled? *Phi Delta Kappan, 55*(5), 290.

Skinner, B. F. (1968). *The technology of teaching*. New York: Appleton-Century-Crofts.

Soares, L. (2012). *A 'disruptive' look at competency-based education: How the innovative use of technology will transform the college experience*. Washington, DC: Center for American Progress.

Spady, W. G. (1988, October). Organizing for results: The basis of authentic restructuring and reform. *Educational Leadership, 46*(2), 4–8.

Spady, W. G. (1994). *Outcome-based education. Critical issues and answers*. Arlington: American Association of School Administrators.

Spellings, M. (2008). *A nation accountable: Twenty-five years after "a nation at risk."*. Washington, DC: U. S. Department of Education.

Thompson, J. F. (1973). *Foundations of vocational education*. Englewood Cliffs: Prentice-Hall.

True, A. C. (1929). *A history of agricultural education in the United States, 1785–1925*. Washington, DC: Government Printing Office.

Tyler, R. W. (1949). *Basic principles of curriculum and instruction*. Chicago: University of Chicago Press.

U. S. Department of Education. (2002). *Public law 107–110, No Child Left Behind*. Washington, DC: Author.

U. S. Department of Education. (2009). *Race to the top program*. Washington, DC: Author.

U. S. Department of Education. (2015). *Every student succeeds act*. Washington, DC: Author.

U. S. Department of Education, & National Center for Education Statistics. (2002). *Defining and assessing learning: Exploring competency-based initiatives*. Washington, DC: USDE.

Vincent, R. D., & Cobb, R. A. (1977). *CBVE: A study to measure its effectiveness in Kentucky, Final Report*. Frankfort: Kentucky State Department of Education.

Wang, V. C. X. (2011). *Definitive readings in the history, philosophy, theories and practice of career and technical education*. Hershey: IGI Global, Information Science Reference.

Wesselink, R., Biemans, H. J. A., Mulder, M., & Van den Elsen, E. R. (2007). Competence-based VET as seen by Dutch researchers. *European Journal of Vocational Training, 40*(1), 38–51.

Wiggins, G., & McTighe, J. (2006). *Understanding by design* (2nd ed.). Upper Saddle River: Pearson.