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# Competency-Based Education

## History, Opportunities, and Challenges

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# Competency-Based Education

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Despite significant recent media and public policy attention, competency-based education and training is not a new concept. It has evolved from early vocational education models to more robust and complex approaches to learning in higher education. This literature review traces some major landmarks in the growth of competency-based education (CBE), including the development of concepts of curriculum mapping and competency frameworks, the current state of CBE implementation, and challenges remaining.

## *Historical Overview*

Modern competency-based education and training movements here and abroad began with U.S. efforts to reform teacher education and training in the 1960s (Brown, 1994; Hodges & Harris, 2012; and Tuxworth, 1994/1989). In fact, Brown (1994) described sequential “generations” of competency-based learning and suggested that the models that emerged in the 1980s and early 1990s actually represented the fifth generation of the competency model.

Brown’s historical account, largely informed by Australia’s competency-based vocational education model, traced the development through the first generation – the application of scientific management to work roles – then the second -- the development of mastery learning models in the U.S. during the 1920s and 1930s. He suggested that the third generation of competency-based approaches was primarily concerned with formative vocational education and training, and reflected instructional design informed by psychology: namely, the work of B.F. Skinner, hence the association with behaviorism.

The teacher education movement in the U.S. represented the fourth generation, moving beyond vocational training to education. This is when the word “competency” began to be used widely in association with this model of instruction and learning, and when a number of concepts associated with modern competency-based learning came to the fore. For example, measurable, behavioral objectives were used to specify what a learner should be able to “do” and at what level (standards-based performance) following training. Brown also pegged the introduction of systematic instructional design and curriculum development to this era. Underlying the transition from one generation of competency-based approaches to the next is the increased focus on outcomes, versus process. Brown noted that, “one of the characteristics that has always been

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associated with CBT is that it is highly contentious as an approach to education and training” (p. 11).

Jones and Voorhees (2002) examined fourth and fifth generation competency-based programs targeting adult learners in the U.S. They found that most programs in postsecondary education focused on development and transferability of competency or outcome-based curricula in specific disciplines and to a lesser extent, specific workplace skills and institutional effectiveness. One effort in particular, Oregon’s Proficiency-Based Admission Standards System, attempted to bridge the competency gap between secondary and postsecondary education. Oregon’s reforms prompted interest in similar programs in 20 other states, including Maryland. Nevertheless, Spady (1977) described these early K-12 initiatives as a largely “...uncoordinated movement,” one that was “...rapidly transforming into a bandwagon that promises to be the Great American Educational Fad of the 1970's” (p.9).

Outside of secondary and higher education, the competency-based education movement also influenced the design and delivery of vocational education in the UK and particularly in Australia, where national reforms in the late 1980s and early 1990s required that all accredited vocational education programs be competency-based (Hodges & Harris, 2012). Additionally, Tuxworth (1994/1989) suggested that competency-based approaches were a prominent feature of health-care related education, training and professional development. However, in their extensive review of the literature from 1966 to 2002, Carraccio, Wolfsthal, Englander, Frerentz, and Martin (2002) found that efforts to apply competency-based models to medical education and training essentially stalled at the conceptual level. They found that most reform efforts centered on identifying general competencies and learning outcomes. According to the authors, both the failure to link curriculum and residency training to specific competencies and the lack of valid assessment tools and methods for evaluation of competencies limited the extent to which medical and health-related education providers were able to operationalize competency-based learning approaches.

Klein-Collins (2013) also documented the rise of competency-based education (CBE) programs in the U.S., noting that, “An intensive focus on what students know and can do rather than on what is taught, for instance, is a hallmark of CBE programs going back at least four

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decades” (p.4). According to Klein-Collins, increased interest in and federal funding support for the expansion of higher education opportunities to working adults in the 1970s led to the development of several well-known outcome and/or competency-based degree programs at Alverno College, DePaul University’s School for New Learning, Empire State College, Excelsior College (previously Regents College), and Thomas Edison State College. A key distinguishing feature of these early programs was their emphasis on learning outcomes and assessment of learning outcomes. Typically, competencies were embedded in the curriculum, though related advancements in prior learning assessment via portfolios and standardized tests accompanied these efforts.

Based on the historical accounts of competency-based education (CBE) in the literature, one could reasonably argue that online learning, advances in learning analytics and adaptive learning technology, and the operationalization of direct assessment models to entire college degree programs (versus post-secondary vocational education) signaled an evolutionary shift toward a sixth generation of competency-based education models. Until recently, CBE programs were primarily a “niche” offering targeting the adult learning segment of the higher education market space. Recent calls for increased productivity, effectiveness, and demonstrable outcomes from the education sector have prompted expanded global interest in the development of major competency-based education initiatives. According to Klein-Collins (2013), “CBE’s sharp focus on student competencies is designed to validate the quality of the degree, and its technology-based approach to learning has the potential to lower cost” (p. 5).

In her first extensive report on competency-based education programs produced for the Council for Adult and Experiential Learning, Klein-Collins (2012) described what may be another distinguishing feature of sixth-generation CBE programs -- the increased emphasis on direct assessment of competencies rather than instructor-led courses. Although some of the more recently developed CBE programs -- including those offered by Delaware County Community College, Rio Salado, and Brandman University -- follow Alverno College’s more traditional approach of positioning competency frameworks within course-based programs designed around credit hours, other programs offered by Western Governors University, Westminster College, and Southern New Hampshire University’s new College for America do not. Rather, students earn their degrees by successfully completing a series of project-based assessments that enable

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them to demonstrate whether they have mastered the stated competencies. Students are assisted, rather than taught, by coaches and mentors, who may also be responsible for curating content that students may need to help master a given competency. Additionally, tuition for these types of programs is typically based on a six-month “all you can learn” flat-rate subscription model, which may enable some students to advance faster than a traditional semester or time-based model.

In summary, the application of CBE models to degree programs can be described as either evolutionary or revolutionary. On the one hand, direct assessment models that decouple the concept of mastery from the credit hour enable some students to complete their degree requirements sooner. Time is variable rather than fixed for each student. For example, a student with significant accounting experience may already possess the knowledge and skill level expected of all learners at the end of accounting 101 and can immediately move to demonstration of mastery through assessment. Yet, in most cases, including Western Governors University, curriculum and competency credits are still mapped back to credit hours, to facilitate vertical and lateral credit transfer (Klein-Collins 2012). Additional research is needed to determine to whether any given implementation of CBE results in superior learning outcomes and efficiencies for different learner demographics or institutional settings.

### *An Emphasis on Alignment*

The concept of curriculum mapping appears repeatedly in the competency-based education (CBE) literature and underscores the need for alignment at all levels of CBE, from conception and design through assessment and reporting. Various frameworks have also been developed to aid in the development of competencies outlining what graduates should know and be able “to do” as a result of their education. As with CBE, competency frameworks are not a new concept. An historical review of the literature documents the use of competency frameworks at the national, institutional, and program levels for well over 25 years. For example, Australian vocational education reforms, which were informed by CBE activity in the U.S. during the 1960s and 1970s, resulted in the development of the Australian Standards Framework (ASF), to which accredited training courses in the country were aligned (Brown, 1994). The related National Framework for Recognition of Training was designed to address

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prior learning and competencies, irrespective of the manner in which they were acquired. In the U.S., the federal Department of Labor and various industry sectors, including manufacturing and automotive, have established competency frameworks emphasizing stackable credentials to ensure that a pipeline of skilled and knowledgeable labor is available to the workforce, and calls continue for more extensive and coherent frameworks (Ganzglass, Bird, & Prince, 2011).

In the higher education arena, Klein-Collins (2012, 2013) outlined a number of recent initiatives aimed at articulating the knowledge, skills, and competencies that college-level learners must develop and demonstrate in order to graduate. At the institution and program level, these frameworks are broad statements of learning outcomes and serve as the standard against which specific outcomes are assessed and measured. The “Essential Learning Outcomes” defined by the American Association of Colleges and Universities (AAC&U) and its member colleges as part of the Liberal Education and America’s Promise (LEAP) project offer one such example. LEAP covers broad knowledge areas, cognitive and practical skills, and emphasizes the application of the stated competencies to complex problems through the use of rubric-based assessments.

The Global Learning Qualifications Profile (GLQP) is an alternative framework developed by Open SUNY, based in part on the LEAP project’s essential learning outcomes and rubrics. The GLQP emphasizes assessment of college-level outcomes obtained through open learning sources including Open Educational Resources (OERs), Massive Open Online Courses (MOOCs) and prior or experiential learning. Development of the GLQP was also informed by the Lumina Foundation’s Degree Qualifications Profile (DQP) (Travers & McQuigge, 2013).

Lumina Foundation’s DQP has been positioned in the competency-based education and assessment literature as an adaptable higher education outcomes framework around which individual institutions can build their own outcome-oriented degree frameworks at the Associate’s, Bachelor’s, and Master’s levels (Ewell 2013; Jankowski, Hutchings, Ewell, Kinzie, & Kuh, 2013; & Klein-Collins, 2012, 2013). It is similar to the European Qualifications Framework, which scaffolds the Bologna Process. The Bologna Process refers to the voluntary agreement and process through which 47 European countries created the European Higher Education Area. The participating countries sought to reduce the fragmentation of the European

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higher education system and improve the mobility, employability and global competitiveness of its graduates. The process involved standardizing degree program structure across member countries and employing qualification frameworks to define specific programs and learning outcomes. Similar to the European Qualifications Framework, the DQP is intended, at least in part, to facilitate the portability of academic credentials, as defined by criterion-referenced learning outcomes, across institutional and geographic boundaries. In the U.S., the DQP may also help address student “swirl” by improving the portability of college credits earned by students who transfer horizontally and/or vertically among multiple colleges or universities during their college careers. By improving transparency, transferability, and recognition of degree credentials, frameworks have been positioned as serving the need for a highly educated and geographically mobile workforce (Adelman, Ewell, Gaston, & Schneider, 2011; Ganzglass, Bird & Prince, 2011).

The DQP is a top-down qualifications framework that speaks to learning outcomes and proficiencies at the credential or vertical degree level, rather than being discipline-specific. Its development was informed by the Tuning USA project, another Bologna-inspired competency framework initiative focused at the subject/discipline level (Adelman, 2010). The Tuning USA project involved study groups of faculty and students from state university systems, community colleges and private institutions in Indiana, Minnesota, and Utah. These groups examined the European process and its associated tools, and each group applied the “tuning” process to two disciplines. According to Adelman (2010), tuning at the discipline level illuminated competencies that spanned multiple degrees, both vertically and horizontally. Therefore, qualification frameworks that represent these competencies at various degree levels represented a logical extension of the tuning process. Design of a credential using a qualification framework such as the DQP, according to Ewell (2013), brings a new degree of intentionality: “Intentionality should govern the goals we develop to define our degrees, the curricula and pedagogies we design and deploy to make the goals real, and the assessments we use to determine if we have been successful” (p.7).

The DQP defines educational outcomes in terms of what graduates know and can do. Lumina’s DQP emphasizes five learning areas (Adelman, Ewell, Gaston, & Schneider, 2011,2014; Kallioinen, 2010). Revised in 2014, they are:



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- Specialized knowledge (what students in any specialization should demonstrate with respect to the specialization beyond the vocabularies, theories and skills of particular fields of study);
- Broad integrative knowledge (consolidating learning from different broad fields of study such as humanities, arts, sciences, and social sciences);
- Intellectual skills (traditional and nontraditional cognitive skills);
- Applied and collaborative learning; and
- Civic and global learning.

As a framework, the DQP is designed to be both cumulative and integrative in terms of how knowledge and skills are developed and applied. (Adelman, Ewell, Gaston, & Schneider, 2011; Ganzglass, Bird & Prince, 2011). The DQP has been used at over 400 colleges and universities in 45 states, including Brandman University, which launched its competency-based framework in 2011, following a two-year redesign of learning outcomes and requirements for its bachelor's degree. According to Klein-Collins, (2012), Brandman's competency-based framework combines institution-specific outcomes with elements of AAC&U's LEAP Outcomes and the DQP. Courses and learning outcomes assessments are also being developed or redesigned in concert with Brandman's localized adaptation of the DQP. The Western Association of Schools and Colleges, the Higher Learning Commission, the Southern Association of Colleges and Schools, and the Council of Independent Colleges and Universities are participating along with several of their respective member schools in projects sponsored by the Lumina Foundation to test and further develop the DQP, which is also a key reference point in the redesign of the accreditation process for those schools (Ewell, 2013).

The DQP neither specifies nor standardizes inputs, such as content or teaching methods (Ganzglass, Bird, & Prince, 2011). Ewell (2013), who was one of the authors of the DQP, pointed out that "DQP competencies are offered as statements of mastery, not aspiration" (p.7); therefore, a fully integrated approach to assessment of mastery is essential to ensure that all students possess the competencies set forth in the DQP. However, as Ewell observed, current outcomes assessment approaches at most U.S. colleges and universities are disconnected with the intentionality of the DQP approach, in that proof of outcomes has been treated largely as an "exoskeletal" or bolt-on process. Although capstone courses, student work portfolios, specific

class assignments, and other types of authentic assessments have become more common than standardized tests, according to Ewell, periodic sampling of student outcomes has remained the basis on which most institutions approach public accountability. Rather than using periodic “check up” methods to assess teaching and learning effectiveness, he suggested that assessment should be deeply embedded or interwoven within a competency approach or framework. The key, argued Ewell, is the alignment of “progressively more challenging exercises, performances, and assignments for demonstrating student mastery at multiple points” (p. 8) with discipline-specific competencies and the institutional competencies specified at the degree level in the form of a framework like the DQP.

The process that Ewell (2013) outlined for achieving this alignment begins with curriculum mapping, which is similar to the process of creating alignment matrices for institutional outcomes assessment. At minimum, this means mapping documents to detail where mastery of a competency is expected and how it will be assessed. Activities and content associated with developing competency are also documented in this process. The result is a map that clearly establishes and communicates the linkages between learning assessment, and specific competencies. Ewell pointed to several examples of institutions currently using the curriculum mapping process to identify linkages between their stated learning outcomes, the competency domains specified in the DQP, and the improved coverage of each domain within the curriculum. Some institutions piloting the DQP have extended the process by mapping specific learning activities and instructional best practices to the defined competencies.

### *The Challenges Ahead*

Although the development or use of degree qualification profiles and other competency frameworks may help guide discussions and practice related to improving learning outcomes and outcomes accountability, scaling and sustaining competency-based education (CBE) reforms based on these frameworks presents a number of challenges. These include, but are not limited to:

- The complexity associated with aligning not just teaching and learning, but also assessments and accountability reporting to multiple outcome-oriented competency

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frameworks and evolving standards, while simultaneously remaining faithful to the unique institutional mission and purpose;

- The development of highly adaptable institutional infrastructures and operations, increasingly collaborative cultures, and permeable boundaries that effectively welcome and encourage critical/appreciative inquiry, teamwork, transparency, internal and external stakeholder involvement, and transformational improvement;
- Lack of agreement in the higher education sector on a single approach to the design or implementation of CBE programs; and
- Concerns by faculty about displacement or change in roles and status.

Roughly 84% of colleges and universities have defined learning outcomes for undergraduates (Kuh, Jankowski, Ikenberry, & Kinzie (2014), an important first step on the road to developing competency-based degrees and academic programs. A number of universities have also engaged in “Tuning” projects aimed at mapping discipline-specific learning outcomes to specific workforce needs and establishing benchmarks describing the knowledge, skills and competencies expected of graduates (Adelman, 2009). Tuning or prototyping a CBE program may be more manageable at the discipline level but the results can fall short of addressing the cross-curricular outcomes and competencies that define the degree at the institutional level, or more specifically, in terms of what graduates with an Associate’s, Bachelor’s or Master’s degree should know and be able to do. Schneider (2013, pp. 23-29) argued that a framework effort focused primarily on “alignment of outcomes lists” and outcomes assessment will fail to achieve the cumulative and integrative learning and demonstration of competencies outlined by the DQP. This viewpoint is also supported by Klein-Collins (2012), who argued that a learning outcome represents a level of knowledge or skill resulting from learning, whereas broader competencies can encompass outcomes, performance levels, and application of knowledge and skills to various contexts. The question as to what is an outcome versus a competency and the lack of a common definition vocabulary around CBE can lead to confusion about the purpose or value of CBE efforts and hinder collaboration on reform efforts.

The challenges cited in the literature related to the development of competency-based frameworks and degree programs are by no means unique to the U.S. model of higher education. Nearly a decade into the European Bologna Process, only a handful of the 46 signatory

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institutions had completed development and self-certification on their national qualification frameworks (Adelman, 2009). Alignment with the Qualifications Framework for the European Higher Education Area, and the more recent European Qualifications Framework for Lifelong Learning, or Lisbon Strategy, has also proved challenging. In addition, as with the DQP in the U.S., there has been significant variations in the implementation of the Bologna Process, according to the Trends 2010 report (Sursock, Smidt, & Davies, 2010). Though most of the institutions have adopted the defined Bachelor's and Master's degree structures and others have added more student-focused and flexible learning approaches, many others have compressed the Bachelor's degree to three years, without necessarily developing new curriculum structures. Additionally, student services have lagged behind, learning outcomes are not always central to the frameworks, and the application of the European Credit and Transfer Accumulation System (ECTS) has not been consistent within or across institutions. Furthermore, collection of institutional, national, and regional data that could be used to assess the effectiveness of the reforms and plan improvements -- such as degree portability, employment, retention and completion rates, instructor-student ratios, and socio-economic demographics-- remains problematic (Sursock, Smidt, & Davies, 2010).

The U.S. literature on CBE also documents significant variation in the implementations of CBE across different institutions, though not in a negative light. For example, Jones & Voorhees (2002) identified experimentation with various methods for demonstrating and documenting competencies as a best practice. Although the Lumina DQP seems likely to be a leading framework for CBE work in the United States, the Lumina Foundation has also encouraged experimentation in the application of the DQP by sponsoring a number of college and university demonstration pilots through regional accrediting organizations and higher education associations (Ewell, 2013). The authors of the DQP describe the framework as serving the need for predictability and transparency through common core learning outcomes. The design of assessments, learning activities, and content aligned to the DQP has intentionally been left to the individual institution (Adelman, Ewell, Gaston, & Schneider, 2011).

As noted by Schneider (2013), the DQP's purpose is not to push for more standardized testing/assessments, but rather to provide a framework with which reliable and valid authentic assessments can be developed and evaluated. Nevertheless, Schneider acknowledged a key

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concern of educational administrators: that DQP, following the path of the Common Core in K-12 education, will inevitably become conflated with standardized college-level learning tests, for which the Lumina Foundation has also been providing developmental funding support.

Schneider refuted this concern, on the grounds that standardized tests fail to capture student application of competencies to non-standard problems, which represent the “ultimate test” of students’ competence. Ewell (2013) also reiterates the central role of faculty in assessment.

Of greater concern to the DQP authors was that colleges and universities experimenting with the operationalization of the framework should complete the process, by developing and testing the validity of the necessary assessments and learning activities that result in actual demonstration of student mastery of the defined competencies (Ewell, 2013). Suggesting that not enough faculty are trained in developing assessments with the level of rigor and consistency needed to effectively enable students to demonstrate the stated competencies, Ewell outlined several examples of competency-based assignments and assessments. He also pointed to Indiana University-Purdue University Indianapolis and Ivy Tech Central Indiana as examples of the collaborative process in which faculty and administrators have engaged to develop and test evaluation rubrics aligned to the DQP.

Ewell’s observations echoed those of Jones and Voorhees (2002), who noted a decade earlier the absence of activity among the institutions related to ensuring the reliability and validity of the competency-based assessments. They too emphasized the need for adequate training related to both the identification and definition of competencies and the selection and development of assessment instruments. They also argued that as a matter of best practice, CBE initiatives should be part of the larger institutional planning process, and underscored the importance of systematically reviewing competency assessment results to identify how and where to improve teaching and learning activities around those competencies. Targeted faculty development activities are needed to help faculty make sense of aggregate assessment results and use the lessons learned for improvements, according to Banta and Blaich (2010). They argued that institutions must find ways to balance the resources associated with data collection with the need to engage faculty, staff, and institutional leaders in data-driven efforts to improve student-learning outcomes. Kuh, Jankowski, Ikenberry, & Kinzie (2014), also suggested that greater faculty involvement in using assessment data to improve student learning outcomes is essential,

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and further suggested, “Colleges and universities must cultivate an institutional culture that values gathering and using student learning outcomes data as integral to fostering student success and increasing institutional effectiveness—as contrasted to demonstrating compliance” (pg.4).

The literature on CBE supports increased engagement by faculty, but not necessarily in a traditional capacity. Whereas direct assessment programs modeled after the ones offered by Western Governors University, Westminster College, and Southern New Hampshire University’s College for America program appear to position faculty in more of a mentoring/coaching role, other competency-based initiatives documented in the literature (Klein-Collins, 2012 & 2013; Ewell, 2013) suggest expanded roles for faculty. For example, at Alverno College, faculty members belong to both a discipline-specific academic department and a broader “ability” department. Prineas and Cini (2011) also predicted faculty roles as becoming more fluid, with adaptive learning technology enabling instructors to receive real-time data on student performance so that they can tailor instruction to students who need additional help advancing through the curriculum. Citing Neely & Tucker (2010), they suggested that instruction will become increasingly collaborative in student-centered online learning, with library staff, instructional designers and student support staff playing roles in the development and improvement of the student learning experience. LeBlanc (2013), on the other hand, described the changes in faculty roles as being similar to the displacement of “craftspeople” when technology enters their professions. The disruptive influence of new enabling technologies on higher education has also been detailed by Soares (2013).

Given the described changes in traditional faculty roles, it is not surprising that faculty have been some of the chief critics of CBE. Some have viewed qualification frameworks, particularly those at the national level, as an intrusion into the learning process and an external attack on the profession (Brown, 1994). Others expressed concern that CBE represents a deconstructionist approach to learning that fails to foster deep and reflective engagement (Talbot, 2004), and that CBE is incompatible with liberal arts education. Neem (2012), for example, argued that institutions that offered direct assessment models of CBE, while utilizing course mentors and recognizing prior learning, were a variation of the correspondence school model. Conversely, one can argue that it is nearly impossible to establish a stance either for or against

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competency-based education on its face, without first defining what one means by CBE – or more specifically, how it has been operationalized in any given context. Although it is possible to discern common threads in the various definitions adopted by academics, practitioners, and policy advocates, a thorough review of the literature leaves one with the understanding that competency-based education is not a neatly packaged education model. Rather, numerous permutations of competency-based education and training have been adapted to various educational settings. Whether the “right” version of CBE has been operationalized depends largely on the results achieved, relevant to the specific goals that drove the specific initiative.

The ultimate success of sixth-generation CBE initiatives, however, may prove less dependent on the specific roles assigned to faculty than the degree to which regulatory policy fosters or hinders experimentation and innovation in higher education models. Numerous news articles in the higher education media as well as other published reports and policy briefs point to student financial aid regulations and current accreditation frameworks as a major barrier to realizing the potential gains in higher education effectiveness and productivity that CBE might provide (Burke & Butler, 2010, Kelly & Hess, 2013; Klein-Collins, Sherman, & Soares, 2010; & Laitinen, 2012). The belief is that current regulations and frameworks represent an essential disconnect with the underlying premise of CBE: the demonstration of competency mastery, rather than seat time, as the measure of student learning. Whereas traditional programs hold time as constant and learning as variable, and that is the underlying assumption behind financial aid regulations, CBE treats learning as constant and time as variable.

Although the U.S. Department of Education (2013) recently reminded institutions that they may apply for approval of competency-based programs to be eligible for financial aid under the department’s direct assessment provision, few institutions have pursued the direct assessment route. Instead, the majority of higher education providers offering competency-based programs, including Western Governors University, have mapped competencies back to credit hours for the purposes of accreditation and federal financial aid. In fact, as noted by Porter (2014), the direct assessment provision in the 2005 reauthorization of the Higher Education Act is less than ideal, since competencies must be mapped to time if students are to receive financial aid.

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Porter illuminated several financial aid-related issues colleges and universities face when designing CBE programs, including the method for determining full-time/part-time status, the definition of what constitutes an academic term in a self-paced program, the design of developmental education and recognition of prior learning in CBE programs, and how satisfactory progress is measured. Porter also cautioned against wholesale change in the regulations without adequate attention to fraud prevention, advocating instead for research on alternative approaches to CBE and financial aid via controlled experimental sites. The Council for Adult and Experiential Learning (CAEL), along with a number of universities including University of Maryland University College, Northern Arizona University, Excelsior College, Westminster College, Alverno College, and Capella University, recently joined together to make the case for CBE experimental sites in a joint response to the U.S. Department of Education's request for information. Their *Experimental Sites Concept Paper: Competency-Based Education* (The Hatcher Group, 2014) outlined the regulatory barriers to higher education innovation and detailed a number of possible experimental programs requiring the waiver of specific provisions in the Title IV student financial laws to enable more students to benefit from CBE degree programs.

Although the approval of experimental sites may lead to emergent best practices and a common vocabulary that adequately defines the sixth generation of CBE in the U.S., others (Ganzglass, Bird & Prince, 2011) see the development of national degree qualification frameworks as instrumental in redefining postsecondary education according to learning outcomes and competencies rather than the accumulation of credit hours. But, as Ewell (2013) has argued, framework approaches aimed at increasing transparency, portability, and workplace relevance require “a comprehensive record-keeping system for posting, housing, and manipulating data on what students have learned” (p.18). An integrated, technology-enabled method is needed for mapping competencies to course materials, learning activities and assessments, communicating this information to students, and measuring and reporting progress at the competency, course, discipline, and institutional level.

With demands being placed on institutions for improving effectiveness and efficiency, the ability to sustain a competency-based approach to learning may be contingent upon an institution's ability to successfully use technology to integrate the processes used for CBE design



and delivery, assessment, and reporting, so that what emerges is a unified, consistent, and systematic process aimed at producing graduates who have demonstrated mastery in all the required competencies set forth by the institution, whether at the general education or discipline-specific levels.

Citing the critical analysis on competency education initiatives in EU member states (Mulder, Weigel, Collins, & Bibb, 2007) and earlier findings by McKenney, Nieveen, & van den Akker (2002), Gulga, Kay and Lever (2013) underscored the critical need for more technology support and infrastructure capacity for integration of multiple learning goal frameworks, competencies, and assessment standards into degree programs and curriculum. According to the authors, without a curriculum mapping infrastructure to account for existing and newer learning goal frameworks, “Tracking of learning goals even at the most generic level, that of the graduate attributes that are supposedly acquired by all graduating students, has proven insurmountably complex for Australian universities” (p.28). The key challenge is providing process stakeholders, including students, a view of the big picture and all of the connection points. Central to this challenge is achieving agreement on the semantic model that will be used to describe learning progression and demonstration of competency (Gulga, Kay and Lever, 2013). Jones and Voorhees (2002) used the term “data ramifications” in describing the need for a standard terminology to facilitate transferability of credentials, arguing that without uniform standards, competencies may not have the same meaning in a variety of contexts within and outside of the university. In their description of “courses and programs that learn,” Prineas and Cini (2011) argued, “To be truly revolutionary, student learning data generated in online technologies must be applied in a systematic way at the program level and in real time, so that students can benefit from ongoing adjustments at the program level—changes in curricula, course sequences, academic requirements, resource allocation, and so on” (p. 10). They also suggested pairing educational technology with a conceptual learning model, such as Chickering and Gamson’s (1987) *Seven Principles for Best Practice in Undergraduate Education*.

### ***Discussion/Conclusion***

Competency-based education in the United States found its roots in early behaviorist models for vocational training. It has evolved over the decades to encompass higher education

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degree programs and curriculum that emphasize demonstrable workforce relevant outcomes or the application of acquired knowledge. Until recently, CBE programs existed primarily as niche offerings at a handful of higher education institutions serving nontraditional students, namely working adults. Advances in educational delivery systems, such as the development of asynchronous online learning enabled more adults to pursue higher education opportunities, reigniting higher education sector interest in CBE. Recent calls by government and employers for increased public accountability and demonstrable outcomes from the education sector have prompted expanded global and stateside interest in the development of major competency-based education initiatives.

CBE has been hailed as a way to help students earn their degrees faster and to reduce costs for both the student and the institution. However, evidence supporting these claims is still largely anecdotal. What is clear from the literature to date is that the development and redesign of education programs around competencies and qualification frameworks represents a complex undertaking – one that requires significant institutional transparency, collaborative cultures, alignment of stakeholder goals and interests around student-centered learning, and effective integration of authentic assessments and other accountability reporting measures and means.

Spady's 1977 paper on competency-based education in the elementary and secondary sectors foreshadowed much of the current discussion on the convergence of various forces driving higher education interest in CBE, and therefore provides an appropriate conclusion to this review:

....a CBE system is never finally and officially 'in place and permanent' but must remain constantly sensitive to the need to change indicators, procedures, or settings in the face of evidence that student progress is faltering. In short, CBE programs require mechanisms that collect and use student performance data as the basis for diagnosing weaknesses and necessary remediation not only for students but for themselves as well. It is here, then, that the delicate balance between student and system accountability is most apparent and the ultimate vitality of a system will be reflected (p. 12).

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