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Capabilities-Based Educational Equivalency Units: Beginning a Professional Dialogue

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Abstract

This article proposes a basic model for the transformation of academic equivalency in distance education, shifting from a unit of measurement that relies on time in the classroom (the Carnegie unit) to one that focuses on learner achievement. The Capabilities-Based Educational Equivalency (CBEE) model puts forward a framework of academic equivalency that is founded on valid and useful instructional design objectives. While allowing time to be variable (rather than constant) and holding academic achievement relatively constant, the CBEE model permits the comparison of student achievement in face-to-face and distance education, as well as between programs delivering instruction via a wide variety of media.

Introduction

With the current increase in the amount of instruction delivered at a distance, the question of educational equivalency is an increasing concern. While convenient, widely accepted, and easily transferred across institutions, the time-based standard—the Carnegie unit—as an indicator of the equivalency of academic courses and degrees may not be appropriate. Furthermore, those models for equivalency that merely build complex relationships between new delivery systems and the conventional standard (e.g., two hours of interactive chat equals one hour in the classroom) will only continue to strengthen the misperception that time in the classroom or time on the Internet is the goal of instruction.

In an effort to begin a dialogue, the authors propose an alternative model for measuring equivalency, based on the attainment and demonstration of learner capabilities. By not relying on a formula for equating time equivalencies, a new standard—Capabilities-Based Educational Equivalency (CBEE) units—offers educators the advantages of (1) a results-focused approach to educational equivalency,

(2) between-institution transfers of credit with a relatively constant level of learner capability, (3) institutional accreditation standards with objectives and assessments built in, and (4) a model that is responsive to emerging educational technologies. Additionally, a CBEE model can provide information for potential learners and employers necessary to make informed decisions regarding the capabilities of course and/or program graduates.[1]

Equivalency Theory and Models

Relying on new technologies, many institutions will find that offering "useful learning opportunities" is the key to successful distance education (Kaufman and Watkins 2000). Offering useful learning opportunities at a time and location convenient to the learner, however, often challenges a principal indicator of educational equivalency: the Carnegie unit, whereby time in the classroom (and not student achievement) is the primary comparable variable of educational courses and degrees across institutions. In response to the demands of distance education (whereby time in the classroom and/or time on task commonly vary), a model of equivalency and accreditation with achievement as a primary unit of comparison should be researched and developed (Mayhew 1991; Pfnister 1991). Heinich and Ebert (1976) noted that "In traditional instruction, time is constant (the number of hours spent in class) and achievement is variable (the grading system). In programmed instruction, time is variable and achievement is relatively constant" (20). Like the programmed instruction of the 1960s and 1970s, distance education can offer learners a delivery system by which time is variable and achievement is relatively constant. Achieving a system with such characteristics, however, requires new approaches to measuring educational equivalency. The proposed CBEE model shifts the focus of educational institutions from the number of hours a student has spent in the classroom to a measure of the knowledge, skills, attitudes, and/or abilities (i.e., human capabilities) a student has attained after completing a course or degree program.

Distance education as an equivalent (or even preferred) alternative to conventional education has not yet been generally accepted (Simonson, Schlosser, and Hanson 1999). As models of distance instruction are advanced, the relationships between alternative modes of delivery (i.e., conventional and distance) and integrated models for demonstrating equivalency should not be ignored. Recent models for defining the relationship of conventional courses and degrees with those delivered at a distance rely on two convenient, but probably inappropriate, variables: time and experiences.

In 1909, while defining what constitutes a college in developing college professor pensions, the board of the Carnegie Foundation for the Advancement of Teaching established a standardized measure of academic equivalency. According to Johnsen and Taylor (1995), "Their definition [of a college] was based on the establishment of a unit of academic work based on time." According to the board's definition, a standard of 750 minutes with a qualified instructor equaled one academic credit hour, or Carnegie unit. The Carnegie unit has since become the standard of academic accreditation. As Heinich and Ebert (1976) noted, "While the Carnegie Unit may not be the only way instruction will be measured by an accrediting association, it is the only way that is accepted without question" (20).

Academic associations have been accrediting institutions since 1910 (Afshar 1991). The primary goal of accreditation has been the evaluation of "quality" in academic programs and institutions. In terms of academic accreditation, "quality" has commonly been defined as "instructional effectiveness in achieving educational objectives," or "quality in education relates directly to the educational appropriateness of objectives and to the effective use of resources in achieving those objectives" (Afshar 1991, 37).[2] Though these definitions emphasize the achievement of educational objectives, no standardized system exists for equating the attainment and demonstration of educational objectives to academic credits received. Lezberg (1998) has noted that "The accrediting bodies do not prescribe any particular method for ensuring the integrity of the academic work" (31). Thus, time in the classroom remains the principal factor in conventional educational equivalency, while learner achievement is left to vary but is assumed to be equal. Challenged by this situation, educators (both conventional and distance) are continually pursuing new methods for ensuring academic integrity and equivalency.

Nearly ten years ago, Mayhew (1991) suggested that

> distance educators, especially given the large number of students expected to be enrolled in programs-at-a-distance by the year 2000, [should] work with accrediting bodies and others to determine how the system of transcript evaluation can be either augmented or replaced by

emphasis upon the learning that should have been achieved by students who have fulfilled the requirements for general education. (20)

In proposing a theory of equivalency, research (Simonson 2000) has suggested that the design and development of different, yet equivalent, learning experiences is necessary for distance education to be regarded as an equitable alternative for learners. While this proposed equivalency theory has generated a desirable focus on the relationship of distance and conventional methods of instruction, it suggests several tenets that may be destructive to the long-term success of distance education.

Equivalency theory suggests a standard of equal (but not necessarily useful) experiences for learners. According to Simonson (2000), "the goal of instructional planning for distance education is to develop an approach that makes the sum of the experiences for each learner equivalent" (7). This mandate for equivalent learning experiences through distance and conventional delivery, however, does not necessarily equate to the attainment of equivalent and/or useful results. The current application of equivalency theory relies on the assumptions that (1) the learning experiences of a conventional course or degree are useful and correct (and should therefore be replicated through equivalent experiences for distance learners) and that (2) equivalent learning experiences will lead to equivalent results for learners without regard to the quality of content and the utility of objectives. As equivalency theory matures, the goal of distance education to achieve equivalency with conventional education will likely shift to one of distance and conventional education both trying to reach the higher standards of achievement required by our communities. Yet, for the time being, by following a model of equivalency theory rooted in a focus on learning experiences, distance education will likely find itself equivalent only to a conventional education system whose effectiveness in providing useful knowledge and skills to all learners is questionable (Branson 1987, 1998).

Based on equivalency theory, new delivery systems can be compared to the conventional standard (the Carnegie unit), e.g., two hours of interactive chat equals one hour in the classroom. These relationships, however, offer little value, as time, in itself, has little relationship with learner achievement (Nelson 1990).[3] The continued dependence of distance education on the time-based standard of conventional education is especially unreasonable for educational delivery systems that are intended to assist learners in achieving useful results at a time and location convenient to them.

Models for the equivalency and accreditation of educational programs (in attempts to respond to social issues as well as to keep pace with changes in technology) have developed without a modern framework for measuring the ability of the courses, programs, and institutions to accomplish their educational objectives (i.e., to add value for learners, institutions, and communities). By continuing to use criteria rooted in "seat-based hours" to measure the equivalency of educational courses and degrees, the field of education has moved to valuing the size, style, color, speed, and "high-tech" appeal of delivery, while failing to fully examine the value added by its content.[4] Should a common "unit of exchange" for educational equivalency be classroom time, time on task, objectives offered, or learning? The authors suggest that the primary factor of equivalency should focus on the attained and demonstrated capabilities of the learner.[5]

The CBEE Model as an Alternative

As educational institutions design and develop courses and degrees to be delivered at a distance, now is an appropriate time to reconceptualize the models used for determining educational equivalency. By utilizing capabilities-based objectives, the CBEE model offers an approach for determining equivalency that is not time dependent, but is responsive to emerging instructional technologies, supportive of systematic instructional design, and focused on the useful achievements of learners.

According to Pfnister (1991, 37), "All we are concerned about is the outcome, or the outcomes, the information or skills that are attained. But, who determines the quality of the content of the outcomes?" In the past, outcomes-based educational programs[6] have been stifled in their success due to the question of who determines the "correct" outcomes to be achieved by students. The purpose of this article is not, however, to discuss who determines the "quality of content" in educational objectives (as important as this is). Rather, it is to propose that a system for measuring equality of courses and degrees can be based on a standardized formula for relating capabilities-based objectives to academic credits. A standardized system for relating the achievement of learners to the measurement of academic credits would provide a basis for distance education whereby time is variable and achievement is relatively constant (thereby allowing academic equivalency and accreditation to be responsive to the new paradigms of education).

The CBEE Model

The pragmatic framework for the CBEE model is a taxonomy of human capabilities. According to Gagné (1977, 1991), there are five "major kinds of learning [results], that is, five types of human capabilities that are learned." These types of human capabilities equate to the possible results of education and provide a structure for the development and application of objectives within education. Gagné suggests that an individual may

1. learn to interact with the environment by using symbols (learned intellectual skills);
2. learn to state or tell some information (learned verbal information);
3. learn the skills to manage his or her own learning, remembering, and thinking (learned cognitive strategies);
4. learn to execute movements in a number of organized acts (learned motor skills);
5. acquire mental states that influence his or her choices of personal actions (attitudes).

One advantage of employing Gagné's taxonomy as a foundation to the CBEE model is that instructional design and development support materials are widely available. For each learned human capability, Gagné (1977, 1991) and Gagné, Briggs, and Wager (1992) provide guidelines for the development of objectives, including suggested verbiage (see Table 1), as well as suggestions for the development of instruction and assessments for the specified capabilities. Gagné (1991) also provides procedures for analysis in deriving appropriate capabilities-based objectives. Other taxonomies of instructional objectives are available (Gagné 1991), but few offer the instructional design and development support that has been developed based on the taxonomy of human capabilities.

Based on Gagné's framework, the CBEE model is based on the proposition that a unit value be given to a learner for mastery of capability-based objectives within an academic course. The number of units per attained and demonstrated capability is related to a hierarchy of interrelated capabilities proposed by the authors and based on Gagné's framework (Table 1). Thus, the mastery of a "defined concept" objective, for example, would result in a value of 3 CBEE units, while the mastery of an "information" objective would result in a value of 1 CBEE unit. While a generalizable model for the relationship of CBEE units and the capabilities hierarchy is proposed, additional research is required to determine the appropriate weighting of capability-based objectives in terms of CBEE units.

Table 1. Human Capabilities and Proposed CBEE Units

Human Capabilities*	Objective Verb*	CBEE Units per Mastered Competency
Intellectual skills		
Discrimination	Discriminates	1
Concrete concepts	Identifies (defines)	2
Defined concepts	Classifies	3
Rule	Demonstrates	4
Problem solving	Generates	5
Cognitive strategy	Originates	6
Information	States	1
Motor skill	Executes	4
Attitude	Chooses	4

*from Gagné 1977

The relationship of capability-based objectives and CBEE units to academic credits, courses, and degrees continues the results-focused approach to educational equivalency. A proposed relationship would formulate 30 CBEE units (built on capabilities-based objectives) to one academic credit (see Table 2). This relationship would provide institutions with a basic framework for converting time-based credits to achievement-based credits with the transition to an objectives-focused curriculum. As with the number of CBEE units assigned to the hierarchy of capabilities-based objectives, the number of CBEE units required for one academic credit is a topic for future research. The required number

Table 2. Proposed Relationship of CBEE Units to Academic Credits

Required Capabilities	CBEE Units per Objective	Total CBEE Units
2 motor skill objectives	4	8
3 problem-solving objectives	5	15
4 rule objectives	4	16
7 defined concept objectives	3	21
Total		60
Academic credit earned		60 / 30 = 2 academic credits*

* based on a proposed minimum of 30 CBEE units per credit hour

of attained capabilities per credit hour may differ among academic disciplines, though the authors propose that, within an academic discipline, a standard ratio should be set for equivalency.

Based on the development of objectives related to human capabilities, a standardized formula can be established for assigning the number of credits a student would receive for a course, based on the student's achievement rather than time in the classroom.

The CBEE model is not currently in place at any academic institution. However, the authors are applying the model in the development of four graduate courses at Nova Southeastern University. A hypothetical application of CBEE units to a course is provided in Table 3.

Without defining the content or evaluating the "quality of content," the CBEE model can provide accreditation bodies with a basic framework for determining the equivalency of academic courses, degrees, and institutions based on student achievement rather than time. The authors, by introducing the CBEE model, do not propose to standardize objectives (curriculum) across programs and institutions, but rather to use a standardized system as a measure of educational equivalency that is not time based.

Table 3. Hypothetical Application of CBEE Units

Minimum Capabilities-Based Educational Objectives for the First Part of an Instructional Design Course	CBEE Units
1. Given the appropriate resources and learning opportunities, in a written report the learner will *identify* and *define* a minimum of 10 primary tasks in conducting a valid and useful needs assessment[7] and needs analysis based on two or more needs-assessment models.	2 + 2 = 4
2. Given the appropriate resources and learning opportunities, in a written report the learner will *generate* a valid and useful explanation as to the possible value of conducting valid and useful needs assessments and needs analyses within his or her organization. The explanation will identify a minimum of 3 possible benefits and 3 possible risks for the organization in implementing the results of the needs assessment.	5
3. Given the appropriate learning opportunities and a list of 10 statements, the learner will correctly *discriminate* between appropriate instructional goals and performance objectives for at least 8 statements.	1
4. Given the appropriate resources and learning opportunities, in a written statement the learner will correctly *identify* a goal statement and an objective for an instructional unit that is approved by the instructor as being appropriate in scope.	2
5. Given an instructional goal identified by the learner, the learner will correctly *demonstrate* an ability to conduct a goal analysis in a written report detailing the analysis tasks and results as specified in Dick and Carey (1996).	4
6. Given a goal analysis conducted by the learner, the learner will correctly *demonstrate* an ability to conduct an instructional analysis in a written report detailing the analysis tasks and results as specified in Dick and Carey (1996).	4
7a. Given a goal analysis and instructional analysis conducted by the learner, the learner will correctly *identify* a minimum of 10 required entry behaviors that must be mastered by the target population.	2
7b. Given a goal analysis and instructional analysis conducted by the learner, the learner will correctly *identify* a minimum of 15 essential characteristics of target learners (e.g., prior knowledge, attitudes, ability levels).	2

Table 3. Hypothetical Application of CBEE Units (continued)

Minimum Capabilities-Based Educational Objectives for the First Part of an Instructional Design Course	CBEE Units
8. Given a goal analysis, instructional analysis, and learner analysis, conducted by the learner, the learner will correctly *demonstrate* an ability to conduct a context analysis in a written report detailing the analysis tasks and results as specified in Dick and Carey (1996).	4
9. Given the appropriate learning opportunities and 20 objectives, the learner will correctly *classify* 16 objectives based on skill type (e.g., psychomotor, intellectual, verbal) as defined in Dick and Carey (1996).	3
10. Given analyses completed by the learner, the learner will correctly *generate* objectives that contain all three objective components (e.g., skill/behavior, conditions, and criteria) for each subordinate skill identified in the instructional analysis.	5
Total number of CBEE units for this selection of course objectives	36

Note: Multiple capabilities can be included in one objective (see objective 1).
Note: The combination of capabilities (e.g., to generate) receives a greater number of CBEE units. For example, an educator could write several *identify* and *define* objectives in place of one objective with *generate*, but would get approximately the same number of units (see objectives 7a, 7b, 8).

Application and Implications

Though the concept of capabilities-based objectives was proposed by Gagné (1977), its application has not yet been successfully integrated into higher education practice. Many factors have contributed to the minimal use of capabilities-based objectives, including a lack of standardized instructional design and development procedures at most colleges and universities. Distance education is, however, changing the long-standing resistance of educational institutions through the advancement of new design models for distance education course development.[8] While the increasing acceptance of instructional design principles is auspicious, it is also essential for their long-term application that the development models and their application are not overly burdensome or without visible utility.

In application, the integration of CBEE units into the instructional design and development processes offers advantages to instructors, curriculum coordinators, learners, and instructional designers. For example, by offering multiple uses for performance objectives (for planning, designing, assessing, accrediting, transferring credit, and promoting educational equivalence with other educational institutions), the linkages and alignments that are likely missing from most curricula can be achieved. By providing learners with capabilities that can be attained through participation in an academic course or program, the CBEE model offers additional information to learners attempting to make difficult decisions regarding courses, course evaluations, programs of study, and academic majors. However, despite the benefits of developing capabilities-based objectives, resistance to the task of writing valid and useful performance- and accomplishment-related objectives should not be underestimated.

Whether or not the CBEE model is applied in an institution, additional resources (above the minimal resources most conventional institutions currently have for design and development of useful distance education courses) are likely to be required, including staff assistance for instructional faculty beyond computer support and training. Systematic instructional design, academic research into the effectiveness of alternative distance delivery methods, and corresponding redesign of administrative processes to support distance delivery are likely resource requirements for those institutions that want to deliver useful learning opportunities at a distance. In a competitive future, successful distance education programs will require a new perspective on education (Kaufman and Watkins 2000). This perspective will include the support of instructional design and development teams for the application of online courses as well as the validation of learning experiences offered at a distance (through the CBEE model or another appropriate model of educational equivalency).

The application of the CBEE model at institutions offering distance education (as well as those offering conventional education or a combination of educational delivery systems) can provide for the relatively easy communication of academic equivalency between courses and degrees. Application of the model may also be integrated with other instructional design and development initiatives to generate a system of design, development, evaluation, improvement, and equivalency that is focused on the attained results of learners.

Summary

In an effort to begin a dialogue for discussion, this article proposes a basic model for the transformation of equivalency in distance education from a unit of measurement focused on "seat-based hours" to one that is focused on learner achievement. The development of the Capabilities-Based Educational Equivalency model will require additional dialogue and research, but it may provide distance education with a starting place for meeting the requirements of an inevitably competitive future.[9]

Notes

1. Attained competence is not necessarily synonymous with professional competence.
2. Kaufman and Zahn (1993) suggest that quality be defined as the fitness for use as judged by the user and the value added for all stakeholders.
3. Nelson (1990) states that "Research and practice indicate, almost unanimously, that increasing allocated time by itself has little influence on increasing student achievement... Too many other factors are involved in the teaching/learning process which limit the influence time has on student achievement" (3). The other mitigating factors include learner ability and development, learner motivation, classroom learning morale, the "curriculum at home," peer groups, time-on-task, and instructional quality.
4. In related work, value added is best seen as being at three linked levels: Micro (individual performance), Macro (organizational results), and Mega (external value added) (Kaufman 1998, 2000; Kaufman and Watkins 2000). This multilevel consideration of results is left for further exposition.
5. "In the future, general education programs for distance learning will, like other educational experiences, be judged more often on outcomes or 'output,' an area in which there remains a good deal of work to be done" (Mayhew 1991).
6. Unfortunately, the term "outcome" is used to describe all results. The authors prefer to relate results on three levels (Mega, Macro, and Micro), where the primary beneficiaries of the results attained are society, the institution, and individuals/teams, sequentially (see Kaufman and Watkins 2000).
7. See Kaufman (1998, 2000) for definitions of "needs assessment" and "needs analysis" (which are different, yet related).
8. It has been the experience of the authors that the "new" models for instructional design are not new at all, but, rather, they are new to the instructional faculty who may not be familiar with the models of systematic instructional design that have been developed since the 1960s (e.g., Dick and Carey 1996).
9. An online forum for continuing this dialogue is available at http://www.megaplanning.com/

References

Afshar, A. 1991. *The attributive theory of quality: A model for quality measurement in higher education*. Ph.D. diss., University of Florida, Gainesville.

Branson, R. K. 1998. Teaching-centered schooling has reached its upper limit: It doesn't get any better than this. *Current Directions in Psychological Science*. 7 (4): 126–35.

———. 1987. Why schools can't improve: The upper limit hypothesis. *Journal of Instructional Development*. 10 (4): 15–25.

Dick, W., and L. Carey. 1996. The systematic design of instruction. 4th ed.New York: Harper Collins College Publishers.

Gagné, R., L. Briggs, and W. Wager. 1992. *Principles of instructional design*. 4th ed. New York: Holt Rhinehart Winston Publishing.

Gagné, R. 1991. Analysis of objectives. In *Instructional design: Principles and applications*. 2nd ed. Edited by L. Briggs, K. Gustafson, and M. Tillman, Englewood Cliffs, NJ: Educational Technology Publications.

———. 1977. *The conditions of learning*. 3rd ed. New York: Holt Rhinehart Winston Publishing.

Heinich, R., and K. Ebert. 1976. Legal barriers to educational technology and instructional productivity. ERIC Document Reproduction Service No. ED 124118.

Johnsen, J., and W. Taylor. 1995. Instructional technology and unforeseen value conflicts: Toward a critique. In *Instructional technology: Past, present, and future*. 2nd ed. Edited by G. Anglin. Englewood, CO: Libraries Unlimited.

Kaufman, R. 2000. *Mega planning: Practical tools for organizational success*. Thousand Oaks, CA: Sage Publications.

———. 1998. *Strategic thinking: A guide to identifying and solving problems*. Arlington, VA: American Society for Training and Development; Washington, DC: International Society for Performance Improvement.

Kaufman, R., and R. Watkins. 2000. Assuring the future of distance learning. *The Quarterly Review of Distance Education*. 1 (1), 59–67.

Kaufman, R., and D. Zahn. 1993. *Quality management plus: The continuous improvement of education*. Newbury Park, CA: Corwin Press.

Lezberg, A. 1998. Quality control in distance education: The role of regional accreditation. *The American Journal of Distance Education* (12) 2: 26–35.

Mayhew, P. 1991. Distance learning and issues of educational quality. In *Distance learning and accreditation: Proceedings of a professional development program*, ed. M. Lenn, 18–21. Washington, DC: Council on Postsecondary Accreditation.

Nelson, S. 1990. *Instructional time as a factor in increasing student achievement*. Portland, OR: Northwest Regional Educational Laboratory.

Pfnister, A. 1991. Distance learning and the implications for accrediting bodies. In M. Lenn. *Distance learning and accreditation: Proceedings of a professional development program*. Washington, DC: Council on Postsecondary Accreditation.

Simonson, M. 2000. Equivalency theory and distance education. *TechTrends* 43, no. 5: 5–8.

Simonson, M., C. Schlosser, and M. Hanson. 1999. Theory and distance education: A new discussion. *The American Journal of Distance Education* 13 (1): 60–75.