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Competency-Based Education, Program Design, and Challenges to Implementation

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Abstract

Conceptual Framework: Competency-based education (CBE) has been widely cited as an educational framework for medical students and residents, and provides a framework for designing educational programs that reflect four critical features: a focus on outcomes, an emphasis on abilities, a de-emphasis on time-based training, and promotion of learner-centeredness. Each of these features has implications and potential challenges for implementing CBE.

Implementation: As an experiment in CBE program design and implementation, the University of Michigan Master of Health Professions Education (UM-MHPE) degree program was examined for lessons to be learned for putting CBE into practice. The UM-MHPE identifies 12 educational competencies and 20 educational entrustable professional activities (EPAs) that

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serve as the vehicle for both learning and assessment. The program also defines distinct faculty roles as assessors, mentors, and subject-matter experts focused on highly individualized learning plans adapted to each learner.

Lessons Learned: Early experience with implementing the UM-MHPE indicates that EPAs and competencies can provide a viable alternative to traditional courses and a vehicle for rigorous assessment. A high level of individualization is feasible but carries with it significant costs and makes intentional community building essential. Most significantly, abandoning a time-based framework is a difficult innovation to implement in a university structure that is predicated on time-based education.

There has been a recent shift to competency-based education (CBE) for health professionals. Although this movement has deep historical roots in the health professions,[1] its current incarnation and the details of its implementation are still evolving. Graduate medical education was a major driver in adopting CBE,[2–4] and CBE is rapidly expanding to practicing professionals and to undergraduate health professions students as well. Many undergraduate and post-graduate medical education programs are adopting competency-based education.[5–7] Higher education is also exploring CBE[8] but with different goals from those in the health professions. Whereas health professions education has focused on ensuring competence in its graduates, higher education has examined CBE to promote accessibility, affordability, and transparency, in addition to improved learning outcomes.[9]

CBE in the health professions has focused on educating health care professionals in order to ensure that learners have the capabilities necessary to provide high quality care. CBE further posits that health professions education should intentionally prepare practitioners to meet the demands of a changing health care landscape. This shift in educational philosophy, framework, and expectations has led to considerable innovation as well as challenges for health professions educators. The opportunity for innovation has encouraged health professions educators to develop competency based curriculum in order to assess both learner outcomes and ensure public trust and practice proficiency.[1,10]

Frank, et al.[11] identified four features that distinguish CBE from more traditional approaches. These are: 1. focus on outcomes, 2. emphasis on abilities, 3. de-emphasis on time-based training, and 4. promotion of learner-centeredness. Each poses challenges and

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implications for designing and implementing CBE, which we illustrate in the context of a CBE masters degree program in health professions education.

Focus on outcomes

Traditional education has been criticized for failing to verify educational outcomes and, too frequently, failing even to make the specific intended outcomes explicit.[1,10] Many traditional programs were designed to provide a broad coverage of the content that faculty experts define as important, but neglect other outcomes. Indeed, accreditation requirements often push programs towards a focus on standardized content rather than on learner outcomes.

In contrast, CBE focuses on measuring the outcomes of learning[12–15] rather than merely assuming that learning has taken place because content was "covered." This outcome focus guides all curricular decisions. Whereas traditional programs generally rely on a legacy curriculum to define educational objectives and assessments (see Figure 1), CBE defines competencies that reflect stakeholder needs (including societal, professional, and institutional goals) and then uses those competencies to guide the curriculum and assessment. Thus, CBE curricula, when designed appropriately, support the development and evidence of learning, and anything that does *not* add to that support is dispensable.[11,16,17]

Because of this emphasis on outcomes, CBE requires greater attention to and investment in assessing those outcomes. CBE has a greater emphasis on assessment because it does not assume that time is sufficient as a surrogate for competence. Evidence for competence can be gathered from many sources and through many methods.[18] All evidence, however, must be judged against standards that derive from the definition of competence and the goals of the program.

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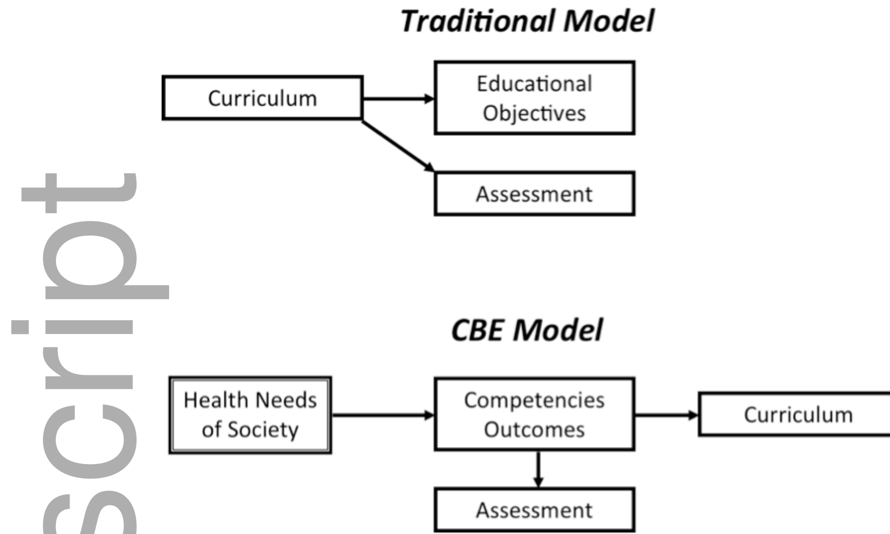

Figure 1

Comparing traditional and competency-based educational (CBE) models of education (from Gruppen, et al.[17])

Emphasis on skills and abilities

The emphasis on content coverage in many traditional education programs tends to promote an emphasis on knowledge acquisition over the higher-level abilities of applying and evaluating knowledge in the context of real-world problems.[19] CBE focuses on more than just knowledge and defines competence as "the array of abilities across multiple domains or aspects of physician performance in a certain context. Statements about competence require descriptive qualifiers to define the relevant abilities, context, and stage of training. Competence is multi-dimensional and dynamic. It changes with time, experience, and setting."[11] Although knowledge is a critical component of competence, so are skills, relevant attitudes, judgment, persuasive leadership – all features that are necessary for effective performance and the professional practice of health professions education. The focus on skills and abilities is not unique to CBE. Many sophisticated traditional curricula share this emphasis, but it is a defining feature for CBE.

De-emphasis of time-based training

One dimension that clearly distinguishes CBE from traditional educational perspectives is the role of time. A common aphorism is that in time-based education, time is fixed and outcomes (graduating competence) are variable, whereas in CBE, outcomes are fixed and time is variable.

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Traditional programs require fixed units of time (semesters, terms) during which students complete courses or rotations. A minimum number of courses or credits is required to finish the program, which translates into a minimum amount of time for the program as a whole. In CBE, competence can be attained and demonstrated without being constrained by semesters or courses. Learners may come to the program with competence already attained in some areas through prior learning and experience and may simply need to have that competence assessed and verified. Competence that is acquired through participation in the program may take place quickly or more slowly, depending on the learner's prior competence level, prior professional activities, motivation, and learning opportunities. Thus, CBE takes a much more flexible view of the time needed for program completion, adapting to a learner's unique requirements in program duration and activities.

Promotion of learner-centeredness

CBE focuses on individualized learning plans that encompass the learner's prior learning, current progress, learning opportunities, and assessment feedback. Although traditional programs also advocate the use of individualized learning, it is often less central to their implementation. The shift to learner-centeredness is complemented by a shift in focus on "learning" instead of on "teaching." The role of the faculty changes from being the source of expert knowledge to being a facilitator and coach of learning. Rather than requiring the curriculum to reflect the faculty's perspective on the world, it must reflect learner needs. This shift is in keeping with the principles for promoting more lasting and meaningful incorporation of knowledge into learner practice.[20] Learner-centeredness requires flexibility in both time and space and may be hindered by topic-focused courses held at a set time and place. The benefit to this approach is that learners can learn through a wide range of activities at their own speed and schedule.[21]

Another component of learner-centeredness is the importance of feedback.[22–24] Individualized feedback provides guidance for the student to identify strengths and deficiencies and guide learning to effectively remedy those gaps. This formative feedback demands more frequent, if lower stakes assessments in CBE that are aligned with learner goals and needs.

Entrustable Professional Activities

Although not a defining attribute of CBE, entrustable professional activities (EPAs) have been developed in the context of CBE and have become a common component of many CBE

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programs. Originally developed by Olle ten Cate,[25] an EPA is part of professional work that requires knowledge and skills and leads to recognizable outputs, which are entrusted by society to qualified personnel. Any given EPA reflects a set of competencies and, in the aggregate, are proposed as a canonical mapping of a given domain.[5–7]

With the growing adoption of CBE, numerous schools, educational programs, specialty societies and national organizations have identified EPAs for learning and assessment. These vary considerably in detail, number, and domain focus.

Putting CBE into Practice

CBE provides a framework for developing educational programs, but it is the implementation that various challenges emerge. Most efforts to implement CBE have focused on defining competencies and often proceed only as far as recasting previous curriculum goals and objectives in the new language of competencies. This is particularly true for many undergraduate curricula that adopt a competency framework based on the ACGME six competency model or the CANMED seven roles. Many specialty societies have invested great effort into creating competency frameworks that are at a greater level of detail in describing skills and capabilities specific to their specialty, and to the development of milestones that reflect progression in competence.

Individualization is another principle that has been implemented in numerous ways as a reflection of learner-centered education. Similarly, there is widespread recognition of the importance of assessment for judging outcomes as well as for educational effects.[26] More specifically, EPAs and milestones have become a central component of assessment in many programs.[27]

The key principle of CBME that has been the slowest to be adopted is that of time in the form of variable duration of educational programs. With very few exceptions,[28] the programs that have adopted CBME still maintain a time-based definition for the program length. In these programs, competencies and their assessment are more often quality assurance concerns (verifying that graduates are competent) than they are guides to progression through the program.

Challenges in Implementing CBE: An Illustrative Case Study

As a case study of the expected and unexpected challenges and lessons of implementing CBE, we examine the University of Michigan's Masters program in Health Professions

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Education (UM-MHPE).[29] The UM-MHPE program is one of a growing number of Master's Degree programs in health professions education.[30–32] However, a detailed examination of the program descriptions contained in FAIMER master list of Masters degree programs around the world[33] suggests that the UM-MHPE is unique in applying CBE to health professions education.

The UM-MHPE breaks with traditional time-based programs, focusing instead on ensuring "competence" in its graduates. It is based explicitly and intentionally on the principles of CBE and seeks to stay close to those principles in its implementation. Although "competence" as a goal does not distinguish CBE from traditional educational frameworks, key differences between CBE and traditional educational frameworks lie in the structure and process of education.

Briefly, the key features of the UM-MHPE are as follows. The degree is centered around demonstrating competence in 12 educational competencies (e.g., understand and apply principles of assessment, develop a program of educational scholarship, understand the background of medical education so as to provide a context for current educational issues and problems (see the UM-MHPE web page[29] for a full description)). Evidence for competence is provided by completion of Entrustable Professional Activities (EPAs)[5–7] in education that are mapped to identified educational competencies. Our program identifies 20 EPAs (e.g., select a learning outcome and design, select, and develop an appropriate assessment method; design and implement a research study; design and implement a curricular intervention) that map onto the 12 competencies (figure 2). Learners work closely with program mentors to define an individualized learning plan that selects and sequences these EPAs. EPAs are designed to be completed in conjunction with the educational responsibilities and activities of the learners in their professional roles as health professions educators. This embeds learning in an applied context and leverages existing opportunities for these educational activities. The EPAs provide both evidence for assessing competence and the vehicle for learning. The UM-MHPE has no courses – all learning is done in the context of EPAs and utilizes any viable instructional resource or format.

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	Education Theory	Curriculum Development	Educational Community	Assessment	Research Methods	Organizational Leadership
EPA 5. Select a learning outcome and design, select, and develop an appropriate assessment method	X	*		X	*	
EPA 10. Develop a proposal for organizational change			X			X

Figure 2

Partial mapping of two entrustable professional activities to a subset of competencies in the University of Michigan Masters of Health Professions Education competency-based program.

(X = necessary EPA-competency link, * = optional link)

In keeping with the CBE principle of disregarding "time in training" as a key component of a program, the UM-MHPE can be completed within variable time intervals, depending on learner initiative, prior competence, and rate of demonstrated competence acquisition. Learners who can demonstrate competence that is derived from prior experience and learning can receive credit for it once they submit the required EPA evidence; they do not need to spend time in areas they are already assessed to be competent. Conversely, learners cannot graduate until they demonstrate the requisite level of performance in all competencies, regardless of how long that requires them to stay in the program.

The focus on competence rather than time for progression through the program highlights the importance of rigorous and trustworthy assessment of competence.[34] The UM-MHPE invests heavily in a competency assessment process that takes learner generated evidence of performance and evaluates it within a designated assessment committee of program faculty. The assessment process explicitly recuses any faculty member who worked with a given learner on the EPA being assessed. This is intended as a means of minimizing bias from the relationship between the learner and teacher[35–39] and promote a more objective, unbiased judgment of the evidence provided. In addition to the summative judgments of competence in a given EPA, the

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assessment committee also provides formative feedback on how the EPA can be improved and where performance does not meet the standards.

Rather than teach courses, faculty serve as subject-matter experts for each EPA to guide learners towards specific resources to address identified gaps. They also advise on the selection and presentation of evidence within the EPA submission to the assessment committee. Finally, program faculty also serve as mentors and as members of the assessment committees.

The first two years of the UM-MHPE have demonstrated that CBE is a viable framework for designing advanced education in health professions education. However, it has also revealed challenges to CBE, some expected, others less so.

Competencies and EPAs Can Replace Courses

Abandoning traditional courses in favor of EPAs as a curricular structure was one of the more radical innovations in the UM-MHPE, so there was concern about how well this would be accepted by students and function as a vehicle for learning. Although there were a few puzzled inquiries about a course list, learners have quickly understood the nature and value of the EPAs as reflections of the work of a health professions educator and as opportunities to learn by doing. The fact that most learners make use of EPAs that build on their existing responsibilities is seen as an added advantage for making learning relevant. Although learners were open to the EPA framework, building the case with university and higher education that competencies and EPAs could rigorously replace traditional courses required considerable time and effort.

The use of EPAs for both learning and for assessment has worked well, providing authentic performance evidence and relevant learning opportunities. This dual use of the EPAs has made providing feedback more complex, however. When an EPA is submitted to the assessment committee, learners frequently have to revise their EPAs to respond to assessment committee feedback and resubmit them before the evidence is considered of sufficient quality to be judged competent. Most often, a single revision is adequate but there have been instances of multiple resubmissions before the evidence is judged to meet standards. These resubmissions provide opportunities for further and deeper learning in the context of the EPA, but learners seem to be more familiar with assessment as an evaluation process rather than as a guide to learning. The individualized nature of the EPAs, each of which reflects the particular opportunities and unique context of the individual learner, and the individualized scheduling of EPAs has required considerable flexibility on the part of the assessment committee.

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Being Timeless in a Time-bound World

The contrast between CBE and traditional, time-based education has been one of the greatest complexities of the UM-MHPE. Although we anticipated that the decision to not base progress on time would be challenging, the extent of the challenges has been somewhat surprising. The learners have adapted to the framework quite readily and relish the idea of being able to finish the program more or less quickly. We have found considerable variation among learners in the rate at which they achieve and provide evidence for competence. Some enter the program with considerable levels of competence and only need to demonstrate those to the assessment committee. Others have little experience and require more time and work to acquire the necessary knowledge, skills and values to then establish their competence. There is also considerable variation in how intensively learners can work on the program – a few have some protected time for the program but many are very much part-time learners.

A competency-based program is a challenge to traditional university administrative structures that are designed around credit hours and semester-long courses. The UM-MHPE does not fit well into the University of Michigan's registration, tuition computation, financial aid, or course transcript systems, so we have adapted and "translated" our CBE structures into elements that the University can accommodate. This translation is not always ideal and has created additional administrative overhead that would not be necessary in a system designed with CBE in mind.

Specifically related to accepting financial aid (e. g., student loans, etc.), the UM-MHPE is classified as a "direct-assessment" program, which requires review and approval by the Department of Education for awarding financial aid to learners. The Department of Education determines whether the program meets the minimum requirements for an academic year and as the basis for payment period and award calculations.[40]

Individualization Works But Is Not Cheap

The UM-MHPE has a very high level of individualization in learning plan, EPA implementation, sequencing and schedule, and professional context for learning. Learners value this individualization highly and the program has operated effectively to support this individualization. There are, however, real costs that stem from this priority.

Traditional, course-based programs tend to emphasize group instruction and fairly uniform experiences for learners at specific times, requiring learners to accommodate the

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schedule of the program and faculty. This provides economies of scale that enable one faculty member to teach multiple learners. Individualized education reduces the economies of scale, sometimes significantly.

Individualization also highlights the fact that learners in the UM-MHPE each have very different experiences as they interact with different SMEs, work on different EPAs, arrange different sequences and schedules of activities, and pursue different goals. Such individual variability in learning is also true in traditional programs as students bring different backgrounds, interests and experiences to the same course and draw their own conclusions, work on their own projects, and write their own papers. However, this diversity is often camouflaged in traditional programs by the apparent uniformity of course titles, syllabi, objectives, assessment methods, and program schedules. Individualization requires considerably more faculty attention to collaboratively design a learning program, advise the learner on resources, and interact with learner questions, discoveries, and assessments.

Community Building Must be Intentional

The individualized character of the UM-MHPE is a key feature but it carries with it new challenges in building a community of learners. When learners are pursuing their own learning programs, activities, and mentored instruction instead of common coursework, they are seldom in the same physical location. The typical, casual interactions that occur naturally in face-to-face settings are often missing and the learners are at greater risk of being isolated.

Community building is also challenged by the asynchronous and dispersed nature of the learner cohort. It has become clear that the educational benefits of learner interactions need to be explicitly fostered and promoted. The learners have taken leadership on this in several ways and the program continues to evolve to promote a community of learners, alumni, and faculty.

Conclusions

Competency based education is a broad framework for education that has utility for many fields. The UM-MHPE reflects the trend towards CBE in the health professions as well as in higher education more generally. We believe the UM-MHPE represents a bold new direction for the education of health professional educators. It is appealing to learners, exciting for faculty, but often challenging for administrators. It demonstrates that CBE "works" in this setting and fits the needs and goals of learners. The program's CBE format allows each learner to fully integrate

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their learning into their own interests and career goals. It assesses competence in authentic, workplace-based activities and certifies that graduates have demonstrated competence.

The UM-MHPE program offers many affordances for further research, including the multi-layered sociocultural contexts for CBE in health sciences environments, mechanisms for facilitating student-centered approaches to learning and seeking/receiving feedback, and exploring how self-regulated learning, as a unique competency itself, can continue to be fostered and enhanced within the structure of a competency-based program. We believe that the focus on meaningful outcomes should be considered for incorporation in all future health professions education programs.

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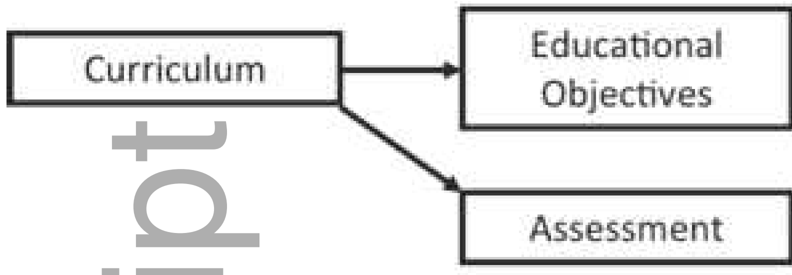

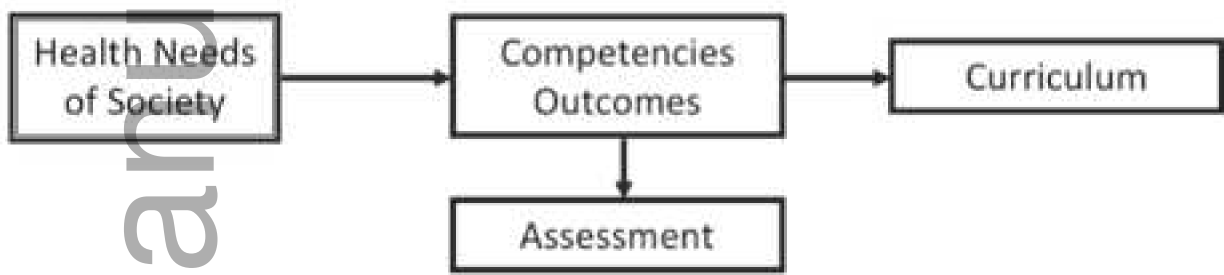

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	Education Theory	Curriculum Development	Educational Community	Assessment	Research Methods	Organizational Leadership
EPA 5. Select a learning outcome and design, select, and develop an appropriate assessment method	X	*		X	*	
EPA 10. Develop a proposal for organizational change			X			X

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