Competency-based education: programme design and challenges to implementation

Larry D Gruppen,[1] John C Burkhardt,[1,2] James T Fitzgerald,[1,3] Martha Funnell,[1] Hilary M Haftel,[1,4] Monica L Lypson,[1,5] Patricia B Mullan,[1] Sally A Santen,[1,2] Kent J Sheets,[1,6] Caren M Stalburg[1,7] & John A Vasquez[1]

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

METHODS As an experiment in CBE programme design and implementation, the University of Michigan Master of Health Professions Education (UM-MHPE) degree programme was examined for lessons to be learned when putting CBE into practice. The UM-MHPE identifies 12 educational competencies and 20 educational entrustable professional activities (EPAs) that serve as the vehicle for both learning and assessment. The programme also defines distinct roles of faculty members as assessors, mentors and subject-matter experts focused on highly individualised learning plans adapted to each learner.

CONCLUSIONS 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 individualisation 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.

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[1]Department of Learning Health Sciences, University of Michigan Medical School, Ann Arbor, Michigan, USA
[2]Department of Emergency Medicine, University of Michigan Medical School, Ann Arbor, Michigan, USA
[3]Ann Arbor VA Geriatrics Research, Education and Clinical Center, University of Michigan Medical School, Ann Arbor, Michigan, USA
[4]Department of Pediatrics and Communicable Diseases, University of Michigan Medical School, Ann Arbor, Michigan, USA
[5]Department of Internal Medicine, University of Michigan Medical School, Ann Arbor, Michigan, USA
[6]Department of Family Medicine, University of Michigan Medical School, Ann Arbor, Michigan, USA
[7]Department of Obstetrics and Gynecology, University of Michigan Medical School, Ann Arbor, Michigan, USA

Correspondence: Larry D Gruppen, Department of Learning Health Sciences, University of Michigan Medical School, 219 Victor Vaughan House, 1111 E. Catherine Street, Ann Arbor, Michigan 48109-2054, USA. Tel: +1 734 936 1662; E-mail: lgruppen@med.umich.edu

INTRODUCTION

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 practising professionals as well as to undergraduate health profession students. Many undergraduate and postgraduate medical education programmes 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]

Competency-based education 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 curricula in order to both assess 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: (i) a focus on outcomes, (ii) an emphasis on abilities, (iii) a reduced emphasis on time-based training, and (iv) the promotion of learner centredness. Each poses challenges and implications for designing and implementing CBE, which we illustrate in the context of a CBE Masters degree programme in health professions education.

FOCUS ON OUTCOMES

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

By 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 programmes generally rely on a legacy curriculum to define educational objectives and assessments (Fig. 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 of competence can be gathered from many sources and through many methods.[18] All evidence, however, must be judged against standards that are derived from the definition of competence and the goals of the programme.

EMPHASIS ON SKILLS AND ABILITIES

The emphasis on content coverage in many traditional education programmes tends to promote an emphasis on knowledge acquisition over the higher-

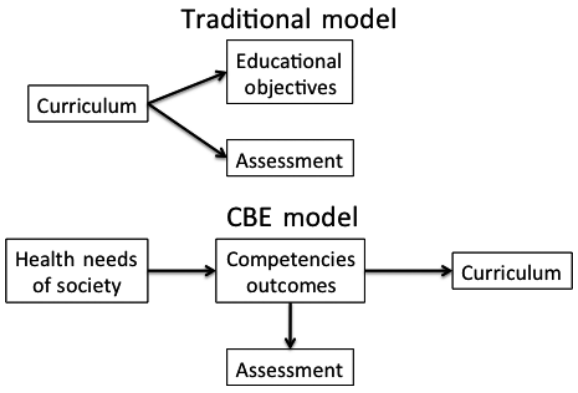

Figure 1 Comparing traditional and competency-based educational (CBE) models of education (from Gruppen *et al.*[17])

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, judgement and 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 of CBE.

REDUCED EMPHASIS ON 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. Traditional programmes require fixed units of time (semesters or terms) during which students complete courses or rotations. A minimum number of courses or credits is required to finish the programme, which translates into a minimum amount of time for the programme as a whole. In CBE, competence can be attained and demonstrated without being constrained by semesters or courses. Learners may come to the programme 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 programme 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 programme completion, adapting the programme duration and activities to a learner's unique requirements.

PROMOTION OF LEARNER CENTREDNESS

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

Another component of learner centredness is the importance of feedback.[22–24] Individualised feedback provides guidance to enable the student to identify strengths and deficiencies and target learning to effectively remedy those gaps. This formative feedback demands more frequent, if lower stakes, assessments in CBE that are aligned with the learner's 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 programmes. Originally developed by Olle ten Cate,[25] an EPA is a part of professional work that requires knowledge and skills and leads to recognisable outputs, which are entrusted by society to qualified personnel. Any given EPA reflects a set of competencies and, in aggregate, they are proposed as a canonical mapping of a given domain.[5–7]

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

PUTTING CBE INTO PRACTICE

Competency-based education provides a framework for developing educational programmes, but it is

with 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 in creating competency frameworks that have 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.

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

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

CHALLENGES IN IMPLEMENTING CBE: AN ILLUSTRATIVE CASE STUDY

As a case study of the expected and unexpected challenges and lessons in implementing CBE, we examine the University of Michigan Master of Health Professions Education (UM-MHPE) programme.[29] The UM-MHPE is one of a growing number of Master's degree programmes in health professions education.[30–32] However, a detailed examination of the programme descriptions contained in the Foundation for Advancement of International Medical Education and Research (FAIMER) list of Masters degree programmes around the world[33] suggests that the UM-MHPE programme is unique in applying CBE to health professions education.

The UM-MHPE breaks with traditional time-based programmes, 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 centred around demonstrating competence in 12 educational competencies (e.g. understand and apply principles of assessment, develop a programme of educational scholarship, and 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 of competence is provided by completion of entrustable professional activities (EPAs)[5–7] in education that are mapped to identified educational competencies. Our programme 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 (Fig. 2). Learners work closely with

	Education theory	Curriculum development	Educational community	Assessment	Research methods	organisational leadership
EPA 5 Select a learning outcome and design, select, and develop an appropriate assessment method	X	*		X	*	
EPA 10 Develop a proposal for organisational change			X			X

Figure 2 Partial mapping of two entrustable professional activities to a subset of competencies in the University of Michigan Master of Health Professions Education competency-based programme. X, necessary EPA-competency link; *optional link

programme mentors to create an individualised 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 highlights 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 utilises any viable instructional resource or format.

In keeping with the CBE principle of disregarding 'time in training' as a key component of a programme, the UM-MHPE can be completed within variable time intervals, depending on learner initiative, prior competence and rate of demonstrated acquisition of competence. 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 in which 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 programme.

The focus on competence rather than time taken for progression through the programme highlights the importance of rigorous and trustworthy assessment of competence.[34] The UM-MHPE invests heavily in a competency assessment process in which learner-generated evidence of performance is evaluated by a designated assessment committee of programme faculty members. 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 minimising bias as a result of the relationship between the learner and teacher[35–39] and promotes a more objective, unbiased judgement of the evidence provided. In addition to the summative judgements of competence in a given EPA, the 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 members serve as subject-matter experts for each EPA in order 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, programme faculty members also serve as mentors and as members of the assessment committees.

The first 3 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 for CBE; some expected, others less so.

COMPETENCIES AND EPAS CAN REPLACE COURSES

Abandoning traditional courses in favour 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 that makes learning relevant. Although learners were open to the EPA framework, building the case within universities 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 evidence of performance 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 the 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 individualised nature of the EPAs, each of which reflects the particular opportunities and unique context of the individual learner, and the individualised scheduling of EPAs has required considerable flexibility on the part of the assessment committee.

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 programme more or less quickly. We have found considerable variation among learners in the rate at which they achieve and provide evidence of competence. Some enter the programme with considerable levels of competence and only need to demonstrate these 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 programme; a few have some protected time for the programme but many are very much part-time learners.

A competency-based programme 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 overheads 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' programme, which requires review and approval by the United States Department of Education in order for financial aid to be awarded to learners. The Department of Education determines whether the programme meets the minimum requirements for an academic year and is the basis for payment periods and award calculations.[40]

INDIVIDUALISATION WORKS BUT IS NOT CHEAP

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

Traditional, course-based programmes tend to emphasise group instruction and fairly uniform experiences for learners at specific times, requiring learners to accommodate the schedule of the programme and faculty. This provides economies of scale that enable one faculty member to teach multiple learners. Individualised education reduces the economies of scale, sometimes significantly.

Individualisation also highlights the fact that learners in the UM-MHPE programme each have very different experiences as they interact with different subject-matter experts (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 programmes 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 programmes by the apparent uniformity of course titles, syllabi, objectives, assessment methods and programme schedules. Individualisation requires faculty members to give considerably more attention to collaboratively designing a learning programme, advising the learner on resources, and interacting with learners' questions, discoveries and assessments.

COMMUNITY BUILDING MUST BE INTENTIONAL

The individualised 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 programmes, 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 the lead on this in several ways and the programme continues to evolve to promote a community of learners, alumni and faculty members.

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 members, but often challenging for administrators. It demonstrates that CBE 'works' in this setting and fits the needs and goals of learners. The programme's CBE format allows learners to fully integrate 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 programme offers many opportunities for further research, including the multi-layered sociocultural contexts for CBE in health sciences environments, mechanisms for facilitating student-centred approaches to learning and to seeking and 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 programme. We believe that the focus on meaningful outcomes should be considered for incorporation into all future health professions education programmes.

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