

Building expertise using the deliberate practice curriculum-planning model

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Abstract

This article reviews critical shortcomings of the current system for the education of physicians. The authors propose and describe a deliberate practice curriculum-planning model for educating healthcare professionals to respond to the demands of modern healthcare. The model integrates contemporary educational philosophies, creating the curricular framework outlined as follows: (1) determine the overall competencies expected of learners at graduation from the program; (2) for program components, develop outcome-based objectives that stem from the overall competencies; (3) to fulfill the objectives, design appropriate content using a variety of learner-centered instructional methods; (4) stimulate acquisition of knowledge, skills, and attitudes through practice accompanied by formative assessment, reflection, and mentoring; (5) establish milestones for summative assessment accompanied by feedback, reflection, and mentoring.

Background

The current fact-intensive, time-based, normatively assessed system of education will not adequately prepare practitioners for the demands and requirements of the twenty-first century healthcare system (Frenk et al. 2010; Gruppen et al. 2010; Stern et al. 2010). The context in which healthcare is provided continues to evolve from the interaction between patient and provider to a collaborative relationship between the patient and an inter-professional team. The care team and the patient will be influenced by the needs of the individual, the family, the community, and multiple third parties. It will not be adequate for healthcare providers to memorize facts or utilize technologic advances without a practiced approach to critical thinking, a knowing use of data gathering, proficiency in the latest technology, and a working knowledge of the non-biologic determinants of health.

Recently, there has been an increased focus on specific solutions for the problems facing twenty-first century medical education. The state of the current medical school curriculum was analyzed and discussed at a conference sponsored by the Association of American Medical Colleges and the American Medical Association in September 2010 (New Horizons in Medical Education Conference 2010). “The status quo is not fit for the future,” said Dr Donald Berwick, a conference speaker. “You cannot separate the pursuit of better education from the pursuit of better care.” At the conference, Dr Brian Hodges, from the University of Toronto discussed two current competing curricular models: the traditional time-based model referred to as “tea-bag steeping,” which bases students’ achievement of competence on the amount of time spent in a course of study, *versus* an approach that centers on specific learning objectives or outcomes tailored to trends and needs in the larger healthcare system. In his speech, and in a paper that

Practice points

- Healthcare education is in transition
- The deliberate practice curriculum focuses on outcome-based objectives and experiential, student-centered learning coupled with feedback, reflection, and mentoring
- A learning culture results from the deliberate practice model, creating the conditions necessary for a quality focus in healthcare
- Lifelong learning will become a natural end product of education
- Communication and mutual respect generated by this model will help build integrated healthcare teams.

he wrote for *Academic Medicine*, Hodges (2010) suggested that medical education should integrate the best features of both approaches.

A commission of 20 global professional and academic leaders, the Education of Health Professionals for the twenty-first Century Commission, (Frenk et al. 2010) proposed a competency-based approach to curriculum, recommending that the “attainment of specific competencies, not time or academic turf protection, must be the defining feature of the education and evaluation of future health professionals.” They supported the use of an individualized learning process in the achievement of the competencies; hence, learners achieve proficiency in variable periods of time.

In the 2010 report of the study of physician education by the Carnegie Foundation, co-investigators, Cooke et al. (2010) examined contemporary educational models through a review of the literature and visits to 11 medical schools in

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the United States. Their research led them to make four major recommendations for change, all designed to better prepare trainees for practice: (1) standardize learning outcomes but individualize the learning process for the student; (2) integrate clinical experience with learning in the basic, clinical and social sciences; (3) engage learners in opportunities for inquiry, discovery, and innovation; and (4) focus on development of the physician's professional values.

These recommendations form a broad consensus that the twenty-first century curriculum should become more outcome-based with a focus on local and global healthcare needs, standardized learning outcomes, an individualized learning process, and greater attention to the development of professional characteristics like lifelong learning and professional identity.

Although medical education has been trying to move away from the Flexnerian model (Flexner 1910), a comprehensive curriculum-planning protocol that will produce lifelong learners motivated by a desire to achieve the highest quality healthcare outcomes has not been uniformly implemented. Over the past three decades, numerous groups and commissions have provided blueprints for reform and learning with varying success: Panel on the General and Professional Education of the Physician and College Preparation for Medicine Report (1984); Edinburgh Declaration (World Federation for Medical Education 1988); Medical School Objectives Project (1998); Accreditation Council for Graduate Medical Education (ACGME) Outcomes Project (2000); Institute of Medicine of the National Academies (2003); Blue Ridge Academic Health Group (2003), report 7 and (2010), report 14; General Medical Council: Good Medical Practice (2006) UK; American Medical Association Initiative to Transform Medical Education (2007); Scottish Deans Medical Curriculum Group (2007; *The Scottish Doctor*); National Alliance for Physician Competence (2009), *Good Medical Practice USA*; General Medical Council: *Tomorrow's Doctors* (2009).

The deliberate practice curriculum-planning model responds to the concerns that have been raised. We believe it will prepare medical students to become twenty-first century healthcare practitioners. This model interprets and integrates contemporary educational models in a new way. It differs from current curricular schemas in that it utilizes a learning improvement cycle based on opportunities for formative assessment, feedback, and mentoring as the learner progresses toward achieving predetermined curricular milestones as the framework for learning.

The deliberate practice model

The model is based conceptually on Ericsson's (2004) premise that continued deliberate practice is necessary for the attainment of expert performance. Ericsson identifies conditions that lead to improvement as: well-defined tasks or objectives; detailed and immediate feedback on performance; and opportunities to improve by performing the same or similar tasks repeatedly. The proposed deliberate practice curricular model expands Ericsson's concept to incorporate critical thinking or analysis in the development of the skills necessary

for the comprehensive functions of a healthcare provider. The deliberate practice curricular planning model requires students and faculty to focus on purposefully designed outcome-based learning objectives, appropriate content and instructional methods, formative assessment, feedback, reflection, and mentoring at each stage of development as the tools that support learning in a competency-based system. The learner is encouraged to develop expertise as a desired outcome. The deliberate practice model differs from time-based curricular plans as it focuses on learning outcomes, feedback, mentoring, and reflection for the achievement of curricular milestones. The model promotes a culture of continuous learning and improvement, thus maintaining the highest quality medical care and professional satisfaction.

The deliberate practice model requires that the school determines the overall competencies expected of learners when they graduate. The model components include the following.

- (1) Outcome-based objectives: Carefully crafted, measurable outcome-based objectives are based on the philosophy outlined by Bloom (1956) and revised by Anderson and Krathwohl (2001). However, in the deliberate practice model, the objectives should prepare the learner for contemporary practice by focusing on higher order functions to encompass the complex nature of the skills, knowledge, and attitudes necessary for the current practice of medicine (Harden 2002) and reflect the critical thinking and work of a practitioner within the context of the local healthcare system. In this system, acquisition of factual information is a basic requirement. Using this factual underpinning, the learner is continually required to employ higher levels of cognitive ability as the essential components necessary for the complex use of reasoning and skills required to care for patients: understanding, applying, analyzing, evaluating, and creating new approaches.
- (2) Content: The content should stem from the outcome objectives of the educational program and mirror the goals and mission of the institution and training needed to meet the healthcare needs of the population. According to Harden (1986), the criteria for inclusion of content should include: relates directly to course objectives; constitutes a "building block" for later; fosters critical thinking; and promotes understanding of core material. Iterative learning will build the learner's knowledge, skills, attitudes, and behaviors over time. Clinical cases or scenarios that reflect local or regional healthcare requirements can serve as the prompts stimulating learning throughout the educational program.
- (3) Instructional methods: Instructional methods should be learner centered, and should align with the content and with the achievement of the specified outcomes. They should be designed to allow learners to achieve the outcome objectives and build their ability to identify the learning they need in order to care for patients, navigate the healthcare system, and communicate with members of the care team.

According to Coffield et al. (2004), “teachers and course designers should pay close attention to students’ learning styles – by diagnosing them, by encouraging students to reflect on them, and by designing teaching and learning interventions around them.” Based on Kolb’s research and the Kolb learning style inventory (Coffield et al. 2004), faculty and students should work together to determine the most effective instructional methods to maximize learning. The faculty should provide a menu of instructional methods, satisfying a range of student learning styles, to achieve the objectives of the program. Instructional methods may include: lectures/podcasts; interactive online modules; interactive large group sessions focused on cases or problems; seminars, conferences, labs that emphasize active learning; problem sets and paper cases; case-based seminars/conferences; standardized patients/simulated exercises; stimulated reviews of documentation and encounters; essays and reflection; and focused electronic searches.

- (4) Assessment: Assessment is a critical feature of any curricular model. Shumway and Harden (2003) state, “It is the responsibility of the medical school to demonstrate that . . . competence has been achieved and the responsibility of accreditation agencies to certify that the educational programs in medical schools can do what they promise. Assessment is of fundamental importance because it is central to public accountability.” Assessment is known to “drive the curriculum” because learners focus on learning what will be tested; assessments should give the right message to learners about what is important.

The deliberate practice model cultivates a comprehensive assessment system. The learner is encouraged to reflect and assess his/her capability, thereby promoting lifelong learning. Formative and summative assessment strategies are based on a detailed characterization of the knowledge, skills, and behaviors expected in a graduate of the healthcare provider-training program, in a learning environment that allows the learner to build ability iteratively over time.

In this assessment system, formative assessment must be incorporated into the educational process and feature feedback and mentoring to guide future learning, promote reflection, and foster deliberate practice. Reflection on feedback defined by Schon (1987) is an integral component. Embracing formative feedback will enable learners to improve skills, learn iteratively, and develop the ability to continue to learn.

Summative assessment occurs at the end of a course of study and determines whether learners have achieved predetermined milestones. Summative assessment should be followed by feedback, reflection, and mentoring in order to maintain a true learning culture.

Importantly, assessment should not consist of an individual test or tool. Commonly used tools should be integrated into an assessment system that measures multiple parameters of performance across the entire curriculum on an ongoing basis (Leach 2002; Van der

Vleuten & Schuwirth 2005; Epstein 2007). The assessment system should consist of both quantitative and qualitative methods in order to provide a comprehensive view of the learner’s abilities. A number of authors have suggested tools for use in an assessment system, including: ACGME (2000) tool box and tool table; Epstein (2007); and Shumway and Harden (2003).

Both formative and summative assessment are based on two models:

- (a) Miller’s (1990) triangle provides the foundation for current thinking about assessment. The model begins with what the learner “knows,” focusing on recall of facts. It progresses through a hierarchy to “knows how,” the ability to solve problems and describe procedures; “shows how,” the demonstration of skills in a controlled setting using patients, mechanical or computer simulations; and “does,” observations of real practice. In the outcomes model of education, most of the emphasis is on “does” at the top of the triangle.

In the deliberate practice model, for each level of the Miller triangle, the student also should demonstrate the higher levels of cognitive abilities used in clinical thinking and problem solving. The Anderson and Krathwohl (2001) revision of Bloom’s (1956) taxonomy begins with “remembering” and progresses upward: Remembering: can the learner recall or remember the facts? Understanding: can the learner utilize ideas and concepts? Applying: can the learner use information in new ways to solve problems? Analyzing: can the learner distinguish the components of a problem? Evaluating: can the learner justify a stand or decision while problem-solving? Creating: can the learner create or develop new points of view or approaches?

- (b) The Dreyfus model expands the concepts of Miller’s triangle to promote proficiency and excellence in the context of the revised Bloom’s taxonomy of cognitive abilities. Dreyfus and Dreyfus (1986, 2004) described a learner’s progress on a scale that ranges from “novice” to “advanced beginner,” to “competent” to “proficient” to “expert.” (1) The “novice,” uses rules to determine actions. (2) The “advanced beginner,” develops strategies to deal with situational cues. (3) A “competent” learner develops new rules and reasoning procedures to decide on a plan of action for each situation. (4) A “proficient” learner easily recognizes patterns within situations and reacts appropriately. (5) An “expert” has learned to distinguish subtle differences in situations. He/she sees intuitively what needs to be achieved and how to achieve the goal. Batalden et al. (2002) and Leach (2002) outlined options taken by learners in the Dreyfus model when mistakes are made. The learner can “detach” from the situation and create new rules to prevent the situation from recurring. This approach arrests development between advanced beginner and competent. Alternatively, the learner can engage all of his/her faculties to provide the necessary involvement with the situation so that competency evolves into proficiency and expertise. Curriculum planners must set

Table 1. Deliberate practice example: nutrition..

A graduation outcome objective	A major component objective (year 1)	Case triggering the content objective	Didactic session to gain knowledge	Clinical interactions to emphasize work of the healthcare provider	Formative
Apply principles of nutrition for maintaining optimal health and managing disease	Explain the concept of fuel homeostasis and use the concept to explain the changes in blood glucose, fatty acids, and amino acid levels that occur in response to variations in timing, quantity and types of dietary fuel intake and to variations in the intensity or duration of physical exercise	Type 1 diabetes	Podcasts or interactive online modules Interactive case-based large group sessions	Case-based seminars/conferences Stimulated review of documentation and encounters Essays and reflection Electronic searches to retrieve information and explore controversies	summativ assessments
					MCQs Problem sets Paper case analyses Checklist documentation Stimulated review of notes, presentations, checklists Reflective narrative

standards that determine the learner's level on the scale and minimum graduation performance. They must also provide opportunities for sufficient formative feedback, reflection, and mentoring so that the learner can engage and progress up the scale.

The same methods are used for formative and summative assessment in this comprehensive assessment system. Basic science and clinical faculty, supervisors, nurses, patients, and other members of the healthcare team should be involved in the assessment process.

The example below, planning for a nutrition-based curriculum module provides detail to elucidate the model's components. Table 1 lists elements of the deliberate practice nutrition protocol.

- (1) Identify outcome objectives: planners should identify overall outcome objectives that graduates of a school or a program would be required to demonstrate regarding nutrition. These will guide the development of all of the supporting objectives.
- (2) Develop content and instructional methods: even in the first years, the content of the curriculum is presented through the use of clinical exercises in which nutrition is an important factor. These cases may be truly clinical or standardized patient encounters, paper cases, problem sets, or more complex dilemmas that play out in a variety of ways. Students should explore factual information through a variety of instructional methods, including podcasts, interactive online modules, and sessions that require them to be prepared for conceptual discussions. Best practice clinical case management can emphasize the role of knowledge in clinical care through seminars, debates, or group problem solving. Each method must include formative assessments that focus on higher levels of cognitive abilities rather than memorization of facts.

- (3) In parallel, students should explore methods to prepare them to assume their role in clinical practice, including: information-gathering, physical examination techniques and the growth of professional attributes like attitude development, integration of knowledge to make decisions, clinical reasoning methodology, and a team approach to thinking and acting. They can explore content using a combination of seminars, stimulated review of clinical encounters integrating knowledge with clinical management, essays, and reflection to explore attitudes and behaviors. Clinicians, basic scientists, dieticians, nurses, and social workers are examples of the faculty who can help this curriculum unfold.
- (4) Assessment: at each step, formative assessments will build student ability. Summative assessments of specific milestones should be administered periodically, based on predetermined outcome measures. Students should also receive feedback and have opportunities for discussion even with the summative exercises so that they can continue to realize their potential. The repeated formative and summative assessment protocols must be designed to increase performance from novice toward expert on the Dreyfus scale.

Discussion

In educating physicians: a call for reform of Medical School and Residency, Cooke et al. (2010) note that in their research for the book, "we saw many instances of foundational knowledge poorly linked to experience; well thought-out, integrated teaching subverted by inappropriate assessments; and missed opportunities for allowing learners to participate in the important non-clinical roles physicians play within healthcare and more broadly in society." Although noting that there were innovative exceptions, they called for a comprehensive new model that allowed for: standardization

and individualization; integration, habits of inquiry and improvement, and professional formation. Use of the deliberate practice curriculum-planning model at medical schools and postgraduate level responds to these recommendations, and permits the schools to showcase the unique characteristics of their mission and their healthcare system.

When the deliberate practice model is fully effective, it will result in a true "learning culture." Hoff et al. (2004) described the advantages of a learning culture for residency (postgraduate) training. The characteristics include: communication and openness (honest reflection and exchange of ideas); inquiry and feedback (encouraging individuals to review, analyze, and question everything that is done); mutual respect and support (setting the tone of the business environment); and adequate time (Schon 1983; Senge 1990, 1999; Schein 1992; Argyris 1999).

The deliberate practice curriculum housed in a learning culture enables the student to learn how to learn while emphasizing the benefits of shared responsibility. The ability to define opportunities for improvement through ongoing examination of actions and interventions relating to clinical problem solving and management serves as the context in which patient care and learning occur.

The deliberate practice model encourages and promotes inter-professional learning and patient care. Feedback is expected and welcomed. Since it is not "wrong" to make a mistake or recognize an opportunity for improvement, continuous quality improvement develops naturally, not as a regulatory requirement. The communication and collegiality promoted in this model should improve faculty and student satisfaction. These practices differ markedly from the current hierarchical environment in which learning takes place.

There are challenges to implementing this model. Planners of a fully implemented deliberate practice curriculum would have to develop strategies to account for differences in learning styles among students while developing the faculty's ability to engage, encourage, and support students differently than in the traditional, segmented medical school curriculum. Schools would need to be creative to manage the intensive nature of the required learning while nurturing large classes of students and providing the appropriate faculty development to facilitate the process. The continuum of education linking undergraduate, graduate, and continuing education would have to become a reality, as this model connects clinical care and learning more comprehensively than before. Assessment methodology that involves all members of the team, like the 360-degree assessment, would become the norm. Admission to medical school and linkages to graduate training would be defined in terms of the personal attributes of the learner that would allow lifelong iterative learning.

Conclusion

The deliberate practice curriculum-planning model is designed to develop expertise during and beyond training. Enveloped in a learning culture, the deliberate practice model can realize the hopes of the public, the requirements of healthcare planners, and the revitalization of the healthcare workforce. The demands for faculty and other resources to carry out this

program are significant, but we believe that they can be overcome. Clinical and basic science faculty will need to team up to allow integration of all years of the educational program through clinical cases. Curriculum planners will have to focus on ability as the desirable outcome and eliminate time to graduation as the most important determinant. By adopting the deliberate practice model, the healthcare system could be transformed through the educational process, emphasizing continuous learning, and a commitment to quality.

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