Using Models of Competence, Mind and Education to formulate a Competencies-oriented, Learning Sciences-driven medical curriculum

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Overview: The Learning Sciences represent a multidisciplinary effort dedicated to achieving three broad educational goals: 1) defining the performance characteristics that differentiate novice from competent performers (models of competence), 2) elucidating the roles of knowledge base structures, information processing mechanisms and intellectual skill development serving as the primary enablers of competent performance (models of mind), and, 3) using both models of competence and mind to inform the design and construction of a learning environment that optimizes the transformation of novices into competent performers (models of education). The following briefly describes how Learning Sciences-derived models of competence and mind are being used to inform and support TCOM’s Academy of Medical Educators (AME) in efforts to design and construct the principles, course design guidelines and instructional methods comprising our evolving approach to 21st century medical education.

Introduction: There is increasing interest in the formation of Academies of Medical Educators and their use as a core venue for faculty development. However, despite a fairly rapid increase in the number of these academies, there are significant barriers to their use as an effective venue for training its members in how to adopt a formal learning sciences-based approach to instruction and assessment. For the most part, these barriers come in the form of the uncertainty and complexity associated with identifying those particular learning sciences principles most likely to serve as a useful and meaningful starting point for engaging and training medical faculty who are able and willing to pursue a career as formally trained medical educators.

On the surface, it would appear to be relatively easy to identify those learning sciences principles that have previously informed the construction of the major curricular models in use throughout contemporary medical education. However, upon closer inspection, contemporary medical education’s core curricular models in themselves are largely not predicated upon such principles.

For example, medical schools employing Discipline, System and even Problem-based Curricular models do so based upon the assumption that the most important competence/outcome of medical education is the development of what is variously referred to as general problem solving skills, critical thinking, higher order reasoning, etc. However, the benefits resulting from the development of these allegedly broadly applicable intellectual skills in clinical care in general, and differential diagnosis in particular, has been largely debunked over the past four decades via research into the cognitive factors underlying the development of competence. With this said, we now describe what is currently understood to be core cognitive factors contributing to the development of competence.

Models of Competence: First and foremost, competence is problem and task-specific, and knowledge based. This is in stark opposition to the commonly held belief that competence is predicated upon
development of previously mentioned ‘generalizable’ intellectual skills (problem solving, higher order reasoning and critical thinking/reasoning). Second, numerous studies have demonstrated that within the context of a given problem and task, the performance of a competent individual is characterized by correctly solving a greater number of problems, doing so via the use of a briefer data gathering strategy (e.g., asking fewer questions/gathering fewer pieces of data), and yet achieving a higher level of accuracy via the gathering of what would be independently termed a greater percentage of ‘high yield’ clinical findings/data elements. The performance of a less competent individual or novice is characterized by a lower level of overall performance or accuracy, a more extensive data gathering/inquiry process and in addition, the gathering of less useful data.

Models of Mind: Given the characteristics of the novice and competent individual, what are the underlying cognitive factors enabling competent performance? One early model of mind useful for professional educators attributes the development of competence as a representation of the learners’ developmentally progressive capacity to transform declarative knowledge into procedural knowledge (i.e. the growing capacity to transform knowledge of ‘what’ into knowledge of ‘how to’).

Decades of research into the cognitive factors enabling this transformation has been recently encapsulated in what is now referred to as Dual Processing Theory – a model of mind describing two different knowledge base structures and information processing mechanisms (i.e., System 1 and 2 respectively) associated with and perhaps enabling development of this transformational intellectual skill. Further research suggests that the transformation of declarative knowledge into procedural knowledge is expedited via multiple practice opportunities and expert-derived formative feedback.

Models of Education: The primary objective of professional development undertaken in TCOM’s AME is to enable faculty to utilize models of competence and mind as the basis for designing and constructing the learning sciences principles serving as the foundation for our evolving, 21st century approach to medical education – a curricular model that we call a ‘problem and task-focused, application-driven curriculum’. This curricular model is founded upon the following core instructional design considerations. Given that competence is problem and task-specific, 1) create and emphasize the use of problem and task focused instructional modules in the curriculum, 2) create instructional activities within these modules which are designed to transmit problem and task-focused declarative knowledge, and additional activities that enable the learners to transform that into the procedural knowledge needed to competently address that module’s particular problem and tasks, 3) in each module, provide students with multiple problem and task-focused application/practice opportunities, and 4) immediately following each application/practice opportunity, provide, corrective, remediative or reinforcing feedback.

Summary: Faculty development is both a necessary and yet extremely difficult undertaking. Learning Sciences principles in general, and more specifically, models of competence and mind represent cognitive tools with which it is possible to efficiently and effectively construct the educational competencies and mind of 21st century medical educators, and thereby, 21st century models of medical education.