The Practical Value of Educational Theory for Learning and Teaching in Graduate Medical Education

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"There is nothing as practical as a good theory."
—Kurt Lewin, 1943[1]

During a recent conference hosted by our institution, a respected medical educator told a group of his peers, "I don't need to know anything about educational theory to be a good teacher. Teaching is more art than science, and so all I really need is content knowledge, practice, and a little bit of natural talent, and I can teach anyone almost anything."

We have heard similar versions of this mantra from other front-line medical educators who teach medical students, residents, and fellows at the bedside and in the classroom. From our perspective, this philosophy on what it takes to be a good teacher is shortsighted. Content knowledge and frequent practice certainly are essential—and a modicum of natural ability does not hurt either—but in our 30 years of combined experience as educators, we have come to see theory as a critical element of good teaching. Yet educational theory has been underappreciated in health professions education.

The purpose of this editorial is to persuade readers who are educators that educational theory holds practical value for their learning and teaching practices in graduate medical education (GME). To achieve this, we first describe how educational theory can contribute to a teacher's regular instructional practice. We also explain some of the limitations of educational theory. Finally, we present a few examples of how educational theory might be applied to learning and teaching in GME.

The Practical Value of Educational Theory in GME

What does theory contribute to teaching that goes beyond content knowledge, frequent practice, and talent? First and foremost, educational theory provides a framework from which any motivated teacher can build effective instruction. Educational theory, including theories of learning and theories of instruction, provides explanations about the underlying mechanisms involved in learning and teaching.[2] Such theories tell us *why* and *under what circumstances* certain learning strategies and teaching methods work, while others do not. *Self-determination theory* is a good example. It suggests that 3 essential psychological needs must be met in order to achieve psychological wellness: competence, autonomy, and relatedness.[3] Familiarity with this theory provides teachers with actionable instructional practices for improving student well-being and learning. For instance, the theory specifies that teachers can promote feelings of relatedness by inviting learners into a professional group and giving them opportunities to practice authentic professional duties appropriate to their level of competence.[4] In doing so, teachers not only bolster student motivation and improve well-being, but also increase the likelihood learning will occur.

Second, educational theory can help educators design instruction grounded in principles that have been empirically tested, rather than being the result of tradition and ritual.[5] In everyday practice, faculty often teach residents and fellows the way they were taught. Although this may be successful, its effectiveness is based more on luck than evidence. In contrast, instruction that is grounded in theory can be systematically tested and incrementally improved, refining both our understanding of how people think and learn and our execution of specific teaching methods. In short, theory and research can work in synergy with educational practice—each informing and enhancing the other. The consequence of such synergy is "a set of scientifically valid methods of instruction based on research evidence and tested theory."[6] With a little ingenuity, skilled teachers can then adapt these methods to their own context. It is here, in the translation from theory to practice,

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where the art of teaching, referenced in the opening vignette, operates.[7]

Limitations to Educational Theory

Educational theory also has limitations. The most important may be the lack of a single unified education theory that fully explains learning and teaching in all contexts. Instead, the teacher is stuck with a collection of theories organized into different theoretical camps or perspectives, which generally explain aspects of learning and teaching in certain situations, but may not be applicable or useful to others. For example, *behaviorism* explains how students in a classroom can be expected to respond to particular rewards and punishments,[2] but it does little to explain how learner well-being is negatively affected by harsh teaching practices like humiliation and shaming during bedside rounds.[8]

With these limitations in mind, it is helpful to think about educational theories similarly to how we think about maps. A map is an abstract representation of the territory it depicts, but no singular map can completely and accurately represent the actual physical terrain.[2] Instead, a given map is just a simplified version of the territory it depicts, highlighting certain aspects and obscuring others. Thus, it has been said that the map is not the territory.[9] Educational theories function much in the same way. Each theory is an abstraction that attempts to explain the underlying mechanisms involved in learning and teaching, but no singular theory does so fully and accurately. As a teacher, it is beneficial to become familiar with, and learn to apply, different educational theories through deliberate practice[10] and systematic experimentation across diverse situations.

Similar to the way maps are updated to reflect changing terrain, educational theories also need to be updated and adjusted to reflect contemporary research and new discoveries. For example, in the early 2000s, researchers were studying *cognitive load theory*, a model based on the premise that learners have a limited working memory capacity when dealing with new information.[11] The researchers found that instructional methods designed to reduce cognitive load were highly effective for novices, but often lost their efficacy, and even had negative consequences for learning, when employed with more experienced learners.[12] This idea, known as the *expertise reversal effect*, has direct implications for instruction, as it suggests that methods should be tailored to the learner's expertise level.

For some teachers, the changing nature of educational theories is frustrating: How can we be confident that we know "the whole truth" about how people learn and how best to teach them, if the theories change? Yet it is precisely the dynamic, evolving nature of theories that gives us an increasingly accurate understanding of complex, multidimensional phenomena like learning and teaching.[2]

Applying Educational Theory to Learning and Teaching in GME

There are many educational theories that could be applied to GME contexts, and we encourage readers to explore them.[2,13,14] However, for the purpose of this editorial, we discuss 4 relevant educational theories and provide overviews of 2 learning theories (TABLE 1) and 2 instructional theories (TABLE 2).

Learning Theories Relevant to GME

Social cognitive theory was developed in the second half of the 20th century in response to the limitations of behaviorism and its sole focus on learner responses to different stimuli.[2] Social cognitive theory posits that learners are active participants (or agents) with their own beliefs, goals, attitudes, and values. Thus, learners, with appropriate support from instructors, should be able to plan, monitor, and reflect on their own learning processes.[15] For instance, an intern struggling with how to take a high-quality patient history could be offered opportunities to set goals for improving his or her history taking, and then reflect on his or her progress with a mentor. A central idea in social cognitive theory is self-efficacy, or a learner's beliefs about how capable he or she can be in a certain area.[16] Positive self-efficacy beliefs develop from active experiences mastering learning content and vicarious experiences observing peers' achievements. Thus, a clinician could build self-efficacy in a new skill with hands-on experiences practicing the skill to attain mastery and through observation of peers having a similar mastery experience.

Situated learning theory is another theory rooted in active participation. However, situated learning theory emerges from sociocultural tradition, where social practices and contexts of learning are viewed as intertwined with the learning itself.[17] In situated learning theory, learning happens in communities of practice—groups of individuals who share goals and activities (eg, a group of clinicians who are interested in assessment research might form a community of practice). Learners new to a community of practice are viewed as *novices* who must actively and authentically engage with others in the community to move from the periphery to the center. For instance, a second-year resident might work with an attending on a medical education research paper, with the resident framing the introduction and the

TABLE 1
Application of 2 Learning Theories to Graduate Medical Education

Educational Theory	Main Idea and Key Terms	Principles	Implications and Examples
Social cognitive theory[15]	Learners are active agents with beliefs, goals, and values who can, with appropriate support, regulate their own learning processes ▪ Self-regulation ▪ Self-efficacy ▪ Modeling	▪ Importance of self-efficacy (a belief in one's capabilities in a specific content area) ▪ Learning can occur through observation ▪ Learning can involve a change in attitude or belief (versus behaviors); that is, learners can "know more than they show" ▪ Learners can be taught to regulate themselves through 3 phases: planning, performance, and reflection	▪ Learners need opportunities to succeed and to observe peers succeeding *Example: Hands-on learning of a procedure using a peer as a model* ▪ Teach learners how to plan for, adjust, and reflect on learning behaviors *Example: Remediate struggling learners with planning and reflecting opportunities*[18]
Situated learning theory[17]	Learning is inherently a social process of active participation, situated in specific contexts and embedded in specific communities of practice ▪ Community of practice ▪ Legitimate peripheral participation ▪ Apprenticeship ▪ Guided participation	▪ Cognition is social and enacted (ie, learning is participating in shared communities of practice) ▪ Through apprenticeship, participants gradually shift identity from the edge of the community to its center ▪ Knowledge is created together (co-constructed) by community members	▪ Learning requires active participation with others *Example: A team-based simulation scenario followed by group reflection* ▪ Novices (newer learners) need opportunities for authentic involvement in community activities *Example: A third-year resident and attending physician working jointly on a quality improvement project*

attending writing the rest of the paper's first draft. Through this shared practice, the resident moves closer to the center of the medical education research community of practice.

Instructional Theory in GME

Complementing the plethora of learning theories are a number of instructional theories. These are models for how to structure learning environments based on principles articulated in particular learning theories. For example, the *4-component instructional design* (4C/ID) model was explicitly created to translate research on cognitive load theory into a practical model for designing instruction.[19] Partly in reaction to teachers' tendencies to engage novice learners exclusively in simple, inauthentic tasks (eg, giving learners a multiple-choice test), 4C/ID encourages instructors to engage learners in more complex and authentic tasks. While this idea is not completely novel in GME, where residents engage daily in authentic tasks in clinics or inpatient units, 4C/ID provides instructors with strategies to better support learners through this complexity and prevent cognitive overload. For example, an intern might be asked to take a complex patient history, with "just-in-time" support from a supervisor when needed (eg, offering a cue to ask about the onset of illness if the resident seems stuck).

An older but still relevant instructional theory is Gagné's *9 events of instruction*.[14] This model gives teachers a concrete structure for creating learning conditions to support different kinds of outcomes (eg, a cognitive outcome like knowledge synthesis or a motor outcome like suturing). Using cognitive processing theories of memory and knowledge retention, and social cognitive ideas about motivation, the 9 distinct sequenced "events" guide instructors in creating supportive learning environments. While these principles were initially developed for classroom learning, they can offer valuable guidance in GME contexts. Providing clear learning objectives and making explicit connections between new concepts and existing knowledge are helpful practices that can improve learning in most educational contexts.[14]

Summary

We encourage GME educators to become better acquainted with educational theory. Doing so will make clear the value of theory, especially in situations where content knowledge, frequent practice, and

TABLE 2
Application of 2 Instructional Theories to Graduate Medical Education

Instructional Theory	Main Idea and Key Terms	Principles	Implications and Examples
4C/ID (4-component instructional design)[18]	Learning is driven by repeated exposure to integrated, real-life tasks with appropriate learner support ▪ Cognitive load ▪ Mental model ▪ "Just-in-time" learning ▪ Part-task practice	▪ Learning tasks should be similar to authentic tasks ▪ Repeated practice with slight variations on a task aids learning ▪ Novel, complex tasks can cause cognitive overload ▪ Outside support (cognitive strategies, content knowledge) helps learners develop mental models	▪ Create authentic learning opportunities *Example: Taking a history from a standardized patient* ▪ Move from simple to complex *Example: Start with very basic patient history questions, then move to detailed history and physical examination* ▪ Provide just-in-time support *Example: Intervening and cuing a question about onset of illness as the learner works with the standardized patient*
Gagné's 9 events of instruction[14]	Different outcomes—verbal, intellectual, cognitive, attitudes, motor skills—should be supported by different learning conditions structured via the 9 events of instruction ▪ Events of instruction ▪ Conditions of learning ▪ Learning outcomes	▪ Support the *cognitive* domain with meaningful context, reasonable chunks of information, and connections to prior knowledge ▪ Support the *affective* domain by establishing expectations of success and giving supportive feedback ▪ Support the *motor* domain with repeated practice and immediate feedback	▪ Design instruction around 9 central "events": (1) gain attention; (2) note learning objectives; (3) connect to prior learning; (4) present content; (5) offer an organizational scheme; (6) allow practice; (7) offer feedback; (8) assess performance; and (9) provide varied practice opportunities *Example: In teaching a new clinical skill, prepare clear learning objectives and relate them to what residents already know (events 2–3), and offer a graphic organizer as you share the information (events 4–5)*

innate teaching ability appear to fall short. It is during those times that educational theory can help to organize and illuminate educational practice. It is during those times that there is nothing as practical as a good theory.[1]

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