Review Article

Learning Theories and their Practical Implications for Classroom Teaching of Medical Students

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ABSTRACT

The process of active learning in medical education is influenced by a multitude of factors, including the educational environment, learner characteristics, and sociocultural contexts. Drawing from various established learning theories, this review explores their practical implications for classroom teaching of medical students. The theories discussed encompass diverse perspectives, ranging from those emphasizing the educational environment to those focusing on personal traits, sociocultural factors, and cognitive processes underlying learning. Examples provided illustrate how these theories can inform teaching practices and optimize the learning experience. For instance, insights from Maslow's humanistic theory highlight the importance of creating a supportive learning environment to foster student motivation and active engagement. Similarly, theories such as self-determination theory and self-regulation theory underscore the significance of intrinsic motivation and self-regulatory processes in promoting deep learning. Additionally, social cognitive theory and the theory of situativity emphasize the dynamic interaction between personal, environmental, and behavioral factors in the learning process. Understanding and applying these theories can help educators tailor their teaching approaches to enhance student motivation, engagement, and ultimately, learning outcomes. By recognizing the complex interplay of factors influencing learning, medical teachers can adopt more effective strategies to support student learning and achievement.

Introduction

Active learning is a complex and multidimensional process. It is influenced by the dynamic interplay of a variety of factors. e.g., the educational environment, personal disposition and behavior of the learner and the surrounding sociocultural milieus. Numerous established theories of educational psychology guide us regarding how to best optimize the learning process.[1-5] The various learning theories that impact learning and teaching fall into the following main categories:

1. Theories focusing primarily on the educational environment.
2. Theories with a primary focus on personality traits or disposition of the learner.
3. Theories that focus on sociocultural factors influencing learning.
4. Theories focusing on the cognitive and metacognitive phenomena that underpin the learning process.
5. Bandura's social cognitive theory.
6. Miscellaneous other theories. e.g., theory of situativity. (Figure 1)

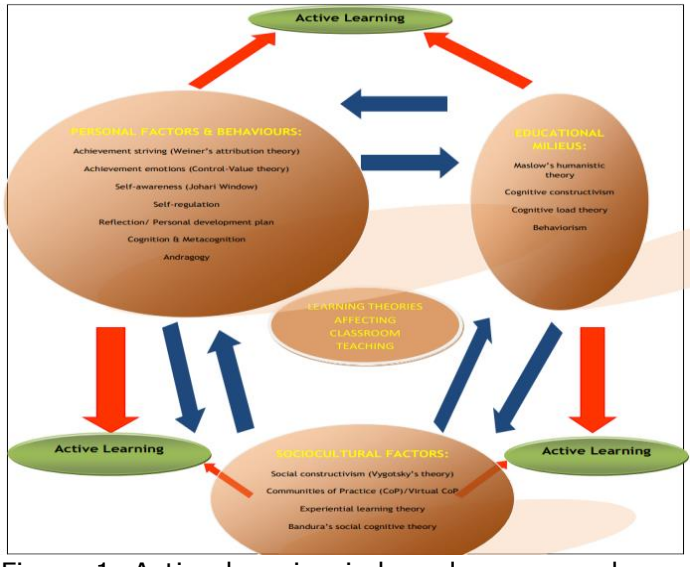

Figure 1. Active learning is based on a complex and multifaceted interplay among a number of personal and environmental factors as explained by the plethora of established learning theories.

These theories are described in detail in the following thematic review:

Theories on Educational Environment

The popular Maslow's humanistic theory represents this group of theories. The theory identifies the factors which are crucial for providing optimal learning environment, that in turn ensures motivation as well as active learning of the students. The original 5-layer model proposed by Maslow included Physiological needs, safety, belongingness, self-esteem needs and self-actualization. The basic needs should be met before the epitome of self-actualization is achieved. The later expanded version of the needs' hierarchy included three more attributes of cognitive needs, aesthetic needs and transcendence needs. [6, 7] Following is a practical example of a medical student:

A trainee resident of surgery was working hard to improve his performance. He was making consistent improvement and thus needed less supervision. Once he missed some steps in the active management of a patient. On the next day, the consultant bullied him, telling him that he always pampered him but he didn't improve. His self-esteem was shaken. Subsequently the trainee did not take any treatment decision on his own and would seek senior's advice for every matter. In this example, one key aspect of the learning environment was made hostile and hence deep learning was inhibited.

Theories on Personal Traits and Disposition of the Learner

Motivation and achievement emotions remarkably influence active learning and cognitive performance of the medical students. We often ignore this crucial aspect of learning process. The control-value theory, self-determination theory, self-regulation theory, Weiner's attribution theory and the theory of andragogy all provide profound insights in this regard.[8-10] A positive environment of motivation and cognitively engaging teaching styles are pivotal for the success of deep learning. We should be cognizant of the facts highlighted in these insightful theories and hence tailor our teaching practices accordingly.

Activating emotions have adaptive sequel whereas deactivating emotions produce non-adaptive and dysfunctional ramifications. Positive activating emotions include hope, joy, pride and gratitude whereas negative activating emotions include anger, anxiety, frustration and shame. Positive deactivating emotions include relaxation, relief and contentment. The negative deactivating emotions include boredom, hopelessness, sadness and disappointment.

The control value theory guides us regarding achievement emotions, their upstream origins and their impact on the learning process. These emotions stem from cognitive appraisal of control and value of the learning activity and its outcome. Research has proved that negative emotions among medical students (i.e., hopelessness, boredom, anger, anxiety and shame), measured at the semester's start correlate to their summative grades as well as drop-out tendency from the courses. Moreover, the negative deactivating emotions (i.e., Hopelessness, boredom) are more detrimental than negative activating emotions (i.e., anxiety, anger, shame) as the former cause disengagement from the learning process. The positive activating emotions of hope, joy and pride lead to superior performance. [11-14]

The self-determination theory links intrinsic motivation (IM) to the basic psychological of needs competence, autonomy and relatedness. It is imperative to instill these feelings among students.

Some students join medial school because of parental pressure or some other external influence. In these cases, IM is largely missing. Positive mentorship in the early years will instill the feelings of valuation (of medical profession), competence, autonomy and relatedness. They will internalize these feelings and make strides towards achievement.[9, 15, 16]

The self-regulation theory highlights self-regulatory processes which underpin higher academic performance. Self-regulation has three phases: forethought, performance and self-reflection. These phases are highly interactive during learning and skills acquisition. Following is a practical example: Reading an un-interesting book in a distracting environment. The process will be impeded by noise and lack of interest in the topic. The goal of reading can be achieved by choosing a quiet room for study. Interest can be generated by motivational self-talk about the value of reading the topic. All these arrangements, followed by performance (reading) with a strong self-belief of goal-achievement represent the phases of self-regulation. [17, 18]

The Weiner's attribution theory provides guidance regarding how students perceive the causality of an event (e.g., success or failure). The perception ramifies from understanding of self and

environment. It determines the subsequent behavior and performance. Attributions have three dimensions of locus (could be internal or external), stability and controllability. Those who make internal, unstable and controllable attributions (e.g., effort, strategy) tend to have adaptive strategies and achieve. Contrary to this those who make external, stable and non-controllable attributions (e.g., luck) tend not to be low achievers. Following is a practical example: High and low achievers differ in their perceptions and motivation. High achievers are self-confident of their ability and effort and hence approach success tasks with the same frame of mind. Success further enhances their confidence. If they fail, it doesn't shake their confidence as they attribute it to bad luck or bad exam (not their fault). Contrary to this, low achievers avoid success tasks as they have self-doubts about their ability or perceive success to be resulting from luck or other uncontrollable factors. Even if they succeed, it doesn't enhance their confidence. [10,18-21]

The theory of andragogy comprehensively outlines the principles of adult learning. Malcolm Knowles was the first to coin the term 'andragogy'. The six assumptions, of the theory of andragogy, are summarized as follows: 1) adults are self-motivated; 2) adults develop self-concept about a topic; 3) adults have self-experience that underpin their new learning; 4) adults prefer the learning that address their immediate needs; 5) adults have a problem-centered focus; and (6) adults identify their own learning needs. As opposed to children, adults are distinctly self-directed learners. They prefer to have the ownership and control of their learnining.[22-27]

Theories with a Primary Focus on Sociocultural Factors

There are certain learning theories which highlight sociocultural factors that influence learning. e.g., Vygotsky's theory of social constructivism, experiential learning theory and communities of practice (CoP) theory.

The Vygotsky's theory holds a central place in this group of learning theories. The basic premise of the theory is that the development of understanding and meaning occur secondary to meaningful social encounters. Vygotsky proposed that cognitive development occurs in a zone of proximal development (ZPD). The ZPD occurs more readily under expert guidance and peer collaboration which provide scaffolding for the new learners.[3, 28] Following is a practical classroom example of the Vygotsky's theory: In a class, the teacher first identifies prior knowledge of the students and then presents a challenging task which is slightly higher than the students' current understanding of a given topic. Group interaction among students and teacher is purposely encouraged to motivate problem-solving methods. The novice learners develop the required knowledge and skills from the more knowledgeable peers and the teacher through the process of scaffolding. Once the novices are reasonable competent, the scaffolding is gradually withdrawn.

Experiential learning is a process in which learning occurs by having an experience of going through a phenomenon. The experience alone is not sufficient for learning to occur. The experience must be interpreted and integrated into existing knowledge structures to become a new or expanded knowledge. Reflection is crucial for this active process of learning. The concept of experiential learning can be easily understood by considering how we all learn from the vast range of events and situations we experience in our daily personal and professional lives. For instance, we can learn about the side effects of a drug by observing the reactions of a patient who is prescribed the drug, or we can develop a clinical skill by effectively applying it. The widely quoted Kolb's experiential learning cycle has four main phases In the first phase, the learner has earned an experience. A second phase of reflection ensues, leading to a third phase of 'abstract conceptualization'. This is when the learner endeavors to understand their actions or reactions to the acquired experience. There is often a focus on identifying any learning needs, such as acquiring new information or skills necessary for future similar situations. Application of the newfound knowledge and skills takes place in the fourth phase. This process can be cyclical, repeated multiple times, with each cycle yielding increased learning. The Kolb experiential learning cycle is applicable to various learning scenarios in undergraduate, postgraduate, and continuing medical education.[29, 30]

The Communities of practice (CoP) refers to a regular social network of professionals who share and acquire a common knowledge base, skills set and develop standard professional practices by learning from each other experiences. The WhatsApp groups and other social media platforms have taken this concept of CoP to the virtual world. The beauty of such interactive platforms is that mutually beneficial discussions happen among professionals from

different quarters of the globe at any point in time. Additionally, such discussions are archived and can be reviewed for later reference.[3, 31]

Theories that Focus Primarily on the Cognitive Processes that Underlie the Process of Learning

The Cognitive Load Theory (CLT) comprehensively addresses the cognitive architecture which underpins the complex processes of learning. The cognitive architecture has three components: 1) Memory systems (sensory, working and long-term memory); 2) learning processes; and 3) the cognitive loads presented to the working memory (WM) during learning. i.e., intrinsic, extraneous and germane loads. The 4C/ID model of instructional design for teaching complex skills exemplifies the practical utility of CLT. The four components of this model include authentic learning tasks, supportive information, just in time information and allowing for part-task practice. [32, 33]

A good medical teacher would strive to reduce the intrinsic and extraneous loads and enhance the germane load in any given learning task. On the contrary, faulty instructional techniques will cause increased extraneous load in a number of ways. For instance, if the teacher fails to provide sufficient guidance regarding a task, then the students can't use adequate problem-solving methods. they instead resort to trial-and-error techniques or waste their precious time and energy in searching for the necessary information required to complete the task. Likewise, when the information required for accomplishing the learning task is dispersed in space (such as in many different books or learning resources) or time (such as in several different lectures), the student is faced with undue extraneous loads to collect the necessary information. Similarly, an unwary teacher presents visual overload by providing too busy slides without giving sufficient time to students to read them. He may also present extraneous loads by providing simultaneous verbal information which is not aligned with the information presented in the slides. A prudent teacher would ensure that both visual and auditory pathways to learning are optimally utilized. The information provided through these two pathways should be aligned as well as appropriately distributed. [32, 33, 34]

Bandura's Social Cognitive Theory

The social cognitive theory blends the cognitive and behaviorist approaches to learning. It proposes that learning is by virtue of a dynamic interaction among personal, environmental and behavioral determinants. There is a reciprocal interaction among these factors. Personal factors include the person's perceptions, attitudes values, goals, pre-existing knowledge and past experiences. Environmental factors may facilitate or inhibit the required actions and goal achievement. Behavior is also a very powerful determinant in the process in the learning process. The relative influences provided by these determinants vary considerably for various individuals and different situations.

Most of the qualities which medical teachers would like to inculcate in their students are fortunately already inculcated in them by nature. So, the good teacher should try to awaken these qualities and sharpen them further. According to Bandura, human beings have five fundamental qualities they favor learning in all circumstances. These qualities include the following: Symbolizing, forethought, Vicarious capability, Self-regulatory capability and Self-reflective capability. Owing to these capabilities, the medical students need appropriate support, guidance and mentoring. This will enable them to set their learning goals and evolve strategies to accomplish their goals. [34-36]

Following is a practical example of the Bandura's theory: Take the example of a trainee resident. When there is hectic pace of clinical work, the resident is overwhelmed by the environmental forces. He is forced to perform to keep the tasks accomplished and fulfill the seniors' expectations. In another scenario, when the resident is acquiring a new skill, the behavior and its feedback will predominate. In yet another case scenario, where situational forces are weaker, personal factors will dominate. So, the choice of the resident will determine whether he wants to study a book or examine a patient or learn a skill. This choice will be based on the resident's goals and needs. [34-36]

Theory of Situativity

The theory of situativity enlighten sus regarding the fact that effective knowledge, thinking, and learning are situated in appropriate experience. All these forms of learning are deeply embedded in the appropriate context. Deep and effective learning occurs when it is appropriately situated in the relevant context. A prudent medical teacher is aware that deep learning occurs only when it is appropriately associated with the context in which it occurs. For example, if a medical teacher wants to

demonstrate a surgical procedure to students, the best place for teaching such a procedure would be an operating theatre when he can align the knowledge, thinking and learning to the actual context.[37]

Conclusion

All the learning theories have applicability to the process of learning. A good medical teacher is fully aware of the complex interplay among the personal, social and educational environmental factors that impact the student's motivation as well as active learning. We as teachers should be cognizant of these interactions and hence tailor our teaching practices accordingly. This approach will have a far-reaching repercussion for our students.

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