Review Article

The Importance of Theory to Inform Practice – Theorizing the Current Trends of Clinical Teaching: A Narrative Review

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Abstract

Clinical teaching lies at the heart of physicians' training; however, it is often opportunistic, haphazard, and lacks a theoretical foundation. Medical education is a profession that requires robust scientific methods and an evidence-based approach driven by accountability and patient safety concerns in the healthcare provision nowadays. Learning theories are increasingly applied in the realm of medicine with implications to the quality of teaching and learning in the clinical environment and the professional growth of medical graduates. These theories elucidate the basic tenets ambient to the intricate process of learning and answer some basic questions of how people learn. Educational theories provide a myriad of benefits to the teaching and learning approaches in the clinical environment. It arms teachers with a repertoire of educational tools and sets out principles to justify their use and predict the conditions under which they may likely work. It enables clinicians to design their teaching based on well-developed objectives and robust methods for their evaluation. As such, learners' capacity to achieve clinical competence is enhanced and their identity formation and other essential attributes of clinical expertise are potentiated. However, it has been reported that learning theories are neither well-articulated in clinical teaching nor educators and clinicians are formally trained on their application in the clinical context. Continuous professional development and faculty training about learning theories are essential to lift their capability to teach effectively in the clinical environment. This article revisited the main learning theories and discusses their application to enhance teaching and learning in the clinical context.

"*There is nothing more practical than a good theory.*"

Kurt Lewin [1]

1. Introduction

Medical education is a resurging science, informed with guiding principles, theoretical perspectives, and a steadily growing body of literature [2, 3]. Clinical teaching is central to the medical profession and fundamental to graduate competent physicians capable

to serve their future roles in patient care and educate young doctors for the sake of the coming generations [4–7]. While teaching medicine is currently perceived as a scholarship that should be practiced with robust methodology and evidence-based approach [3, 8, 9], clinicians were often criticized for lacking insight into their educational interventions and their tendency to reiterate and adopt the same methods in which they have been taught [10, 11]. Learning theories were popularized in the field of cognitive psychology and are currently increasingly discussed and applied to improve teaching and learning outcomes in the clinical context [12–15].

This review attempts to explain the basic tenets of the main learning theories and discusses their application to enhance teaching and learning in the clinical context. An account on the principles of the behavioral, cognitive, constructivist, humanistic, and sociocultural learning theories would be provided to justify the current trends of clinical teaching and explicate with examples their potential to enhance clinical competence. A literature review was conducted in PubMed, Scopus, Google, and the websites of *Medical Teacher* and *Medical Education* journals. Key articles in English were identified and reviewed to inform the ideas discussed in this article.

1.1. Advantages of learning theories to the educational enterprise

A theory is defined as "a system or idea which explains a phenomenon or events and their relationship" [15, 16]. In the educational enterprise, it is seen as a lens through which pedagogical methods can be examined and is simply crucial to understand how students learn [6, 15, 17]. Application of learning theories in the clinical context has numerous advantages to the process and outcomes of clinical training and has implications for the quality of clinical teachers and trainees alike [7, 18]. Working knowledge of learning theories may provide a framework to evaluate the effectiveness of educational strategies and predict the conditions under which they may likely work [9, 15]. Besides, educational perspectives would inform the construction of sound learning objectives and the development of rigorous assessment schemes for their evaluation [19]. Learning theories arm teachers with a repertoire of pedagogical options from which they can choose to appropriately plan and conduct their teaching [16, 20, 21]. It also creates a common discourse through which teaching can be discussed and negotiated and a platform on which research about education can be grounded [10, 12, 18]. However, some reports have shown that learning theories are still not well articulated in clinical teaching and that educators and clinicians are not formally trained on their application in the clinical context [3, 7, 9, 20, 22, 23].

1.2. The learning metaphors

Before we embark on discussing learning theories, it is worth considering first some intriguing tenets underpinning the mysterious process of learning. Sfard (1998) elaborated on the *learning metaphors* that he emphasized as the basic assumptions and beliefs behind the artistry of "*how we learn*?" He described two dimensions, the "*acquisition*" and the "*participation*" metaphors [24]. The former is grounded in

the positivist paradigm where knowledge is viewed as an objective truth that exists in the environment from which learners borrow and deposit to fill their minds [18]. Thus, learning is portrayed as an individual act of "possession of something" and the teachers' role is to fill the learner's mind (as a container) with knowledge which once gained are owned by the learner (as property or goods) [6]. Although this perspective has traditionally shaped our understanding of the learning process and taken as granted for long, it does not explain how knowledge is cultivated in the environment and how it grows thereafter [24]. The *participation metaphor*, on the other hand, views learning as a process of "*knowing*" through interaction with other members in the community. This conceptualization is related to the constructivist orientation where knowledge is envisioned as a relative reality rather than objective truth and meaning is constructed by the pursuit of shared activities instead of mere deposition of facts and concepts. Notably, learning in the participation metaphor is seen as a collaborative act in contrast to the acquisition metaphor, which forecasts learning as an individual phenomenon [24]. Also, learning in the acquisition metaphor is perceived as a passive process in which learners take up what their teachers transmit to them, while in the participation metaphor, learners have agency over their learning where they contribute actively to the construction of meaning and teachers are mere facilitators in the process [16]. Put simply, learning in the lens of participation is something that learners "do" while in the acquisition orientation is something being "done to them" [24].

Although knowledge about the learning metaphors is essential to facilitate understanding of the various learning theories, this distinction is only operational [24]. It has been argued that acquisition is also manifest in the constructivist dimension where knowledge can be transferred (as a property) across similar situations, while acquisition on the other hand can be aided by human and physical stimuli in the learning environment (a participative element) [6, 24, 25]. Therefore, the two metaphors are intertwined and complementing rather than opposing parallels albeit with different weights and contributions to the educational perspectives. As Sfard warned, educators should be attentive not to adopt one metaphor exclusively at the expense of the other.

1.3. Behaviourism

The behavioral learning theory is rooted in the work of Pavlov and his conditioned reflexes who hypothesized that a desired response can be produced if it is paired to a certain stimulus and that reinforcement can be used to modify that response [10, 26]. The behavioral orientation entails that the stimulus for learning exists in the environment and that learners observe and emulate the actions of others to induce a change in their behavior which itself is *learning* [6, 10, 16]. Therefore, behaviorism hinges on the notion that learning is a process of change in the learners' behavior and consequently a measurable construct through observation [10, 11, 15].

Skinner's research on operant conditioning asserted that three concepts in the behavioral ideology strengthen learning: *contiguity*, *frequency*, and *contingency* [10, 19, 27]. *Contiguity* refers to the latency between a stimulus and a response, or in other words the degree of how much two stimuli are "*closely brought together to form a bond*"

[19]. Arguably, learners should engage in deliberate practice of what their teachers do "*drill and skill*" to master a given task or competency [11, 14, 16]. Thus, learning is consolidated as more practice is enacted which relates to the concept of *frequency* mentioned earlier [27]. *Contingency* on the other hand implies improvement in learning when performance is intimately followed by reinforcement or *feedback* [19]. Feedback has a central role in learning and is crucial to upheave learners' performance toward an ideal goal [11]. Constructive feedback can be used positively to strengthen good performance or negatively to prohibit unwanted behavior [10]. The shorter the time lapse between the performance of a task and reinforcement, the more powerful the ensuing learning [27]. *Contingency* or "*recency*" therefore codes for one of the essential features of feedback execution, that is, its immediacy [2, 28, 29].

1.3.1. Implications to practice

One of the salient applications of behaviorism in medicine is competency-based medical education [10, 14, 15, 19, 21]. Learning in this paradigm is anchored to behaviorally developed objectives, which clearly define what and how a given task should be performed and lay down the criteria of its acceptable performance [10, 21]. It follows that teaching should be structured around the specified objectives where teachers are responsible to demonstrate how a desirable task should be executed [11]. Learners should then engage in repeated practice under the observation of their tutors who should avail any chance to provide them with feedback until competency is achieved [21]. Breaking complex tasks into smaller chunks simplifies learning and coincides with the structured teaching admirable in this context [14, 26]. Assessment strategy in this paradigm is based on direct observation of performance, which can be run through an objective structured clinical examination (OSCE), rubrics, or checklists [21]. Critiques of behaviorism allude to the dominance of teachers (hence teacher-centered) and the passivity of learners in the educational process [10, 17].

In summary, behaviorism proposes that stimuli for learning are embedded in the environment and that learning is manifested as a change in behavior. This learning theory ignores what happens inside learners and concentrates on their behavior, which in turn can be measured to quantify learning [30]. Behaviorism stands on two legs — deliberate practice and feedback — and offers a strategy to teach and learn behavioral outcomes stipulated in the context of competency-based education. It shifts the emphasis on teachers and depicts leaners as passive agents in the learning process, which highlights its teacher-centeredness.

1.4. Cognitivism

Cognition refers to "*the mental process of knowing and understanding*" (*Collin's Dictionary*) [31]. Behaviorism has been criticized for overly simplifying learning as a primitive reflex of stimulus and response action, which ignores the complex processes that take place in the brain during learning [10]. In contrast, the cognitive learning theory de-emphasizes what learners do and focuses on their minds [11]. Cognitivism revolves

around how information is perceived, processed, interpreted, and stored in the brain, how memory functions, and how individuals make sense of their experiences [6, 15, 25]. The ability of learners to solve problems is linked to their capability to access knowledge structures (also known as *schemas*) in their minds to extract solutions, and cognitivism postulates that learning is a process of continuous building and modification of those schemas in the learner's mind [7, 25, 32]. As such, cognitivism places agency on learners as responsible for building and organizing their knowledge schemas in an accessible manner and hence is a learner-centered approach [15, 21]. The responsibility of teachers remains to adopt educational strategies that foster linking new information to prior knowledge and help learners to transform and augment cognitive schemas in their minds to enhance learning and promote retention [14, 21, 25, 32].

1.4.1. Applications of cognitivism to promote clinical reasoning

The development of clinical reasoning marks expertise in the medical profession and can be explained in part by the cognitive theory [14]. Cutrer *et al.* (2013) and Conn *et al.* (2012) highlighted the notion of the dual-process theory, which marks two main approaches to clinical reasoning. A slow and explicit analytical approach is used in unfamiliar situations and applies to novice learners, while a fast and intuitive non-analytical path is used by expert clinicians in familiar situations [14, 33]. Merrienboer and Sweller (2010) in their elaboration on the "cognitive load theory" emphasized some tactics of memory function. They described two types of memory, limited working memory and a central processing unlimited long-term one. Short-term working memory relies on the central memory which holds the cognitive schemas that determine the capacity of problem-solving and hence expertise in clinical practice [32]. Supported by those principles of cognition, instructional designs should, therefore, promote the construction and automation of cognitive schemas to enhance clinical reasoning; some strategies will be summarized here. The hypothesis-driven history taking and physical examination, which entails prediction of the most likely diagnosis and the expected physical findings before commencing on clinical evaluation of patients, enhances diagnostic ability [14, 33]. The use of the "*contrastive approach*" in clinical teaching which denotes teaching from presentation to diagnosis may enable learners to generate discriminative questions and foster their clinical reasoning [10, 14, 33]. For example, teaching dysphagia moving from this compliant to its underlying causes would allow learners to grasp the differentiating features among its etiology and is much more effective than when each of the causes is taught in isolation (Figure 1). As learners see more and a variety of cases for a given clinical problem or complaint, they develop "*illness scripts*" that are sets of clinical features coding for certain diseases [2, 23, 33]. For example, the combination of right iliac fossa pain, anorexia, and mild fever in a young adult would bring the likelihood of acute appendicitis quickly to the mind of an expert clinician whenever they encounter a patient with such complaints. This also relates to the concept of "*pattern recognition*" which contributes to the non-analytical approach of clinical reasoning and marks one of the attributes of expertise in clinical practice [10, 14].

Problem representation using "*semantic qualifiers*" is another method akin to enhance clinical reasoning [33]. Semantic qualifiers are opposite words, example, *acute* versus *chronic*, *sudden* versus *gradual*, and *unilateral* versus *bilateral*, which can be used to summarize clinical scenarios in a way that points to a possible cause [14, 33]. For example, a heavy smoker with sudden onset of severe epigastric pain and no comorbidities may point to the possibility of perforated peptic ulcer rather than gastritis. Scaffolding is aiding learners to solve problems that were out of their reach through the incorporation of new knowledge into their existing cognitive schemas [11, 25, 34]. It is enhanced with the provision of working examples before learners embark on problem-solving and posing questions thereafter to probe their understanding [12, 23, 32]. Concept maps and algorithms are graphic representations of knowledge structures and are useful teaching and learning methods to augment understanding of complex principles and their relationships (Figure 1) [14, 21]. The use of templates to systematize clinical teaching and assessment of diagnostic reasoning is a rational philosophy to boost cognitive learning. Implementation of conventional and modified history-taking formats (e.g., SAMPLE; signs and symptoms, allergies, medications, past medical history, last oral intake, and events leading to injury or illness), the use of simulation to structurally teach physical examination, experts "thinking aloud" and verbalization of learners' thought through application of the SNAPPS (summarize, narrow, analyze, probe, plan, select), and RIME (reporter, interpreter, manager, and educator) models to assist their reasoning ability are few examples [2, 7, 12, 14, 33]. Last, diagnostic timeout is a strategy in which learners pause to compare and contrast the available clinical data for the last time before they conclude the most likely diagnosis [33]. It is particularly useful to avoid anchoring to a diagnosis too early in the process of clinical reasoning which is a common cognitive bias known as *premature closure* [14].

In summary, the philosophy of cognitivism is centered on how learners receive, interpret, and store information in their minds to retrieve it later for problem-solving. Students are the active agents in the learning process and teachers' responsibility is to design their educational interventions in ways that help learners organize knowledge effectively in their minds. Several strategies are amenable to enhance clinical reasoning based on the cognitive perspective as discussed earlier.

1.5. Constructivism

Learning in this perspective is ascribed to meanings built by learners based on their personal experiences [15, 21, 35]. While positivism considers knowledge as objective truth, constructivism, instead, attends to the concept of reality that is the view of the world from the learners' perspective [6, 25]. When learners interact and discuss their views and understanding in collaborative learning encounters, they develop new meanings and gradually build new knowledge constructs or modify their existing ones [18, 22]. As such, learners share the cognitive effort to solve a given problem that is known in the discourse of constructivism as "*shared cognition,*" and the resulting knowledge is perceived as the pool of their individual shares [6, 12]. Accordingly, learning within this orientation is seen as "participative" or "expansive" in nature and a collaborative action
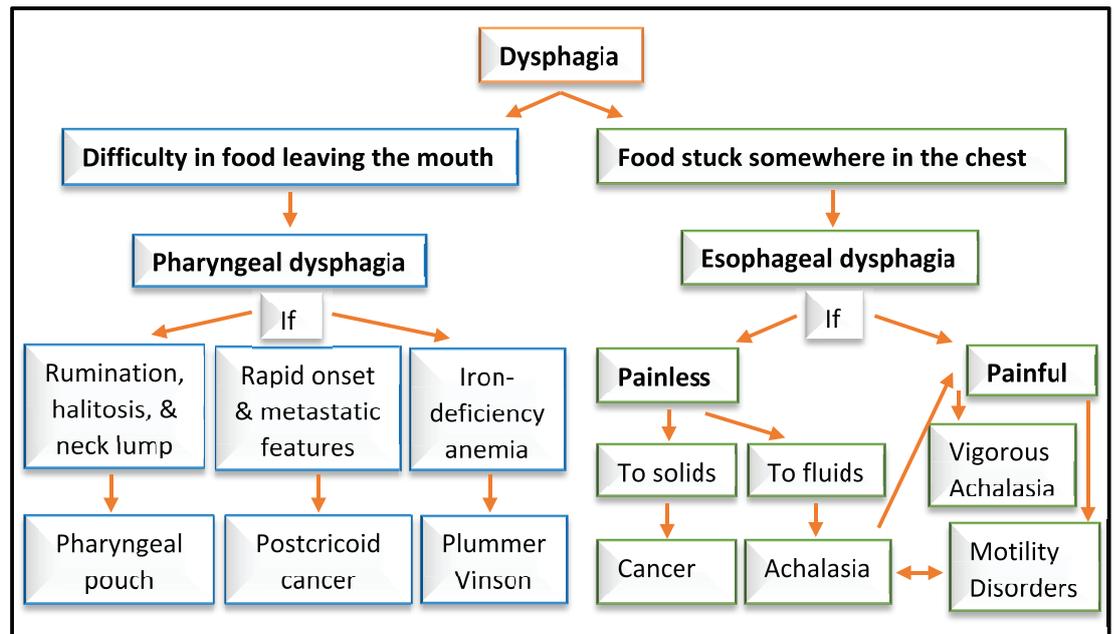
Figure 1: Teaching from presentation to diagnosis (also an example of a concept map).

rather than an individual phenomenon as mentioned earlier [36]. Closely related to the constructivist theory are the concepts of *assimilative* and *transformative* learning [37]. The former occurs when learners integrate new knowledge in their existing cognitive schemas and therefore build more complex mental maps to solve future problems [6, 9, 18, 37]. The latter is about restructuring their existing cognitive schemas into new ones that are more inclusive, discriminating, and justifiable to guide action [18]. Both types contribute to "expansive learning" which may supervene when learners engage in mutual discussion and critical appraisal of their thoughts and opinions with their peers and teachers. Constructivism is therefore a learner-centered approach where teachers are responsible mainly to guide learners and facilitate their participation in meaningful experiences to promote learning [38].

1.5.1. Implications to practice

Based on the aforementioned discussion, it appears that dialectic and collaborative teaching and reflective strategies drive learning in the world of constructivism [21]. Team-based learning, problem-based learning, case-based discussions, and interprofessional education are notable examples where learning is fostered through interaction [12, 25, 38–40]. Multidisciplinary rounds, tumor boards, morbidity and mortality meetings, morning reports, discharge clinics, and journal clubs attended and nourished by discussion among different levels of clinical expertise are rich sources of learning that are admired in the clinical context [9, 12, 25, 41]. Technology may also afford flexible and practical platforms for participative learning, particularly for the current generations of students and discussion boards, forums and wikis are extensively used nowadays to enhance teaching and learning in the field of medicine [12, 42, 43]. This article was

written concomitantly to the thrilling outbreak of the Coronavirus disease (COVID-19) and we have learned, perhaps unwillingly, invaluable lessons of how technology may supplement educational institutions with smart solutions when conventional teaching and learning activities are not at hand.

1.6. Experiential learning

The notion of experiential learning or experience-based learning is popular in clinical practice [6, 18, 44]. It involves the construction of meaning by learners based on their experiences either individually or in groups and contributes predominantly to the development of competence and practicing skills in the workplace [7, 18, 35, 45, 46]. It is enhanced by reflective habits to deepen understanding and teachers should, therefore, provide learners with experiences that foster practice and reflection [19, 47]. Critical reflection is a powerful tool to enhance learning within the continuum of medical educa-tion from the undergraduate level to continuous professional development in workplace settings [6, 11, 15, 26]. Reflection is the process of critical analysis of the current and past experiences to extract lessons to inform future practice [6, 7, 48]. Donald Schon, an ancestor of reflective practice, has argued that professional knowledge acquired during formal learning may not provide solutions to some "messy" and unexpected situations of daily living problems; hence, reflective capacity is an essential attribute of life-long learners [23, 49, 50]. Two entities of reflection were described "reflection-in-action" and "reflection-on-action" [25]. The former relates to the ability to critically appraise events while they are occurring, while the latter is thinking about experiences after their conclusion, and in both situations the aim is to learn how the practice could be improved in the future [2, 21]. The "Kolb's learning cycle" established a useful framework for reflection in which learners repeatedly generate abstract knowledge from their concrete experiences and apply that to improve their future work [7, 18]. Consequently, medical curricula should thrive to integrate educational tools that instill in learners and demonstrate their reflective ability. Portfolios, logbooks, progress files, diaries, patient narratives, and reflective journals are examples of such tools that enhance reflection and learning when properly designed and utilized [9, 14, 19, 20, 30].

1.7. Sociocultural learning

Since its description by Vygotsky, the sociocultural learning theory has attracted edu-cationalists and gained increasing acceptability in the field of medicine [18, 23, 46]. Learning in this paradigm is proposed as a process of socialization tied to the context in which it takes place and mediated through participation in shared activities that are of common interest to the people in that context [6, 16, 22, 35, 45, 46]. Social learning, therefore, is a context-driven phenomenon and hence the synonyms "*contextual*" and "*situated*" learning [6, 14, 18, 19]. Indeed, the learning environment has an influential role on learners as the admired values, behaviors, and traditions are embedded in the daily activities of a given enterprise [4, 12, 30, 35, 46, 51, 52]. You may not learn history taking, physical examination, and communication skills unless you interview patients in clinical

premises and examine them to elicit sings of their illness [2, 14, 44, 53, 54]. Likewise, you may not learn to speak or behave as a "doctor" unless you observe them performing their daily activities in hospitals [6, 35, 44, 5). However, learning in the sociocultural dimension does not ensue only from team members and patients but may also stem from other materials in the environment like wallcharts and devices from which valuable learning opportunities may arise [6, 49, 53, 56]. The sociocultural theory explains how medical students and residents adopt the professional identity of a "physician" when they participate in meaningful activities among health teams in clinical settings and therefore learning in this respect is depicted as a process of "*becoming*" and is part of daily living (Figure 2) [13, 22, 44, 53, 54].

The notions of "Communities of practice" and "legitimate peripheral participation" by Lave and Winger are related to and explain learning in the sociocultural ideology [18, 22, 46]. In legitimate peripheral participation, newcomers to a vocation participate in teamwork initially from the outside as they lack the essential knowledge and skills prominent in the field. However, when they gradually participate in the professional activities in the field, they steadily acquire the skills, become more competent, and move to a central position in the team [5, 44, 53, 55]. The "zone of proximal development" is another concept in the sociocultural dimension and denotes the capacity for additional learning that ensues from interaction with others [2, 23]. It should be noted that while individuals learn from their participation in the shared tasks in a profession, they might also contribute new meanings and understanding to the teamwork and hence further enrich knowledge and practice in the context [18]. As such, learning in the sociocultural perspective is a dynamic process of a reciprocal relationship between learners and their educational environment [6, 44]. The sociocultural theory places emphasis on learners as active agents in their learning and the teachers' role is to model the observable behaviors to be learned and to create opportunities for meaningful participation in team activities [11, 18].

1.7.1. Implications to practice

Based on the aforementioned account, social learning appears to have important implications for medical education. The apprenticeship model that is historically popular in the realm of medical education is well-grounded in the sociocultural dimension and represents a rich context for learning [18, 23, 54, 55]. It follows that educational strategies that maximize the participation of medical students in patient care activities are conducive to their learning and professional growth [2, 6, 35, 43, 51, 53]. Longitudinal clinical clerkships, community-based programs, shadowing, and peer-assisted learning are examples in which learning about patients and their diseases in real-world life can be greatly enhanced [5, 7, 45]. Early exposure to the clinical environment and invitation of real patients to teaching encounters may be helpful techniques to promote students' learning at the beginning of their studies [7, 14, 18, 53, 54]. Shahi *et al*. (2015) evaluated medical students' experiences in three educational settings: a tertiary hospital, a hybrid community model, and an exclusive community-based program. Among these settings, students valued their participation in the community-based program for three reasons:

availability of opportunities to participate in patient care, prolonged relationship with healthcare members and patients, and the effective supervision offered by clinicians during the study period [4, 57]. Curricular approaches in medical education should, therefore, build on the provision of early and immense supervised participation in patient care duties where students may learn not only from patients and healthcare providers but also from other artifacts in the clinical environment [6, 14, 18, 23]. Clinicians should act as role models, develop and maintain effective supervision and mentorship attributes to guide students' learning, and create a medium of mutual trust and respect in which students can safely learn [9, 18, 21, 23, 58, 59].
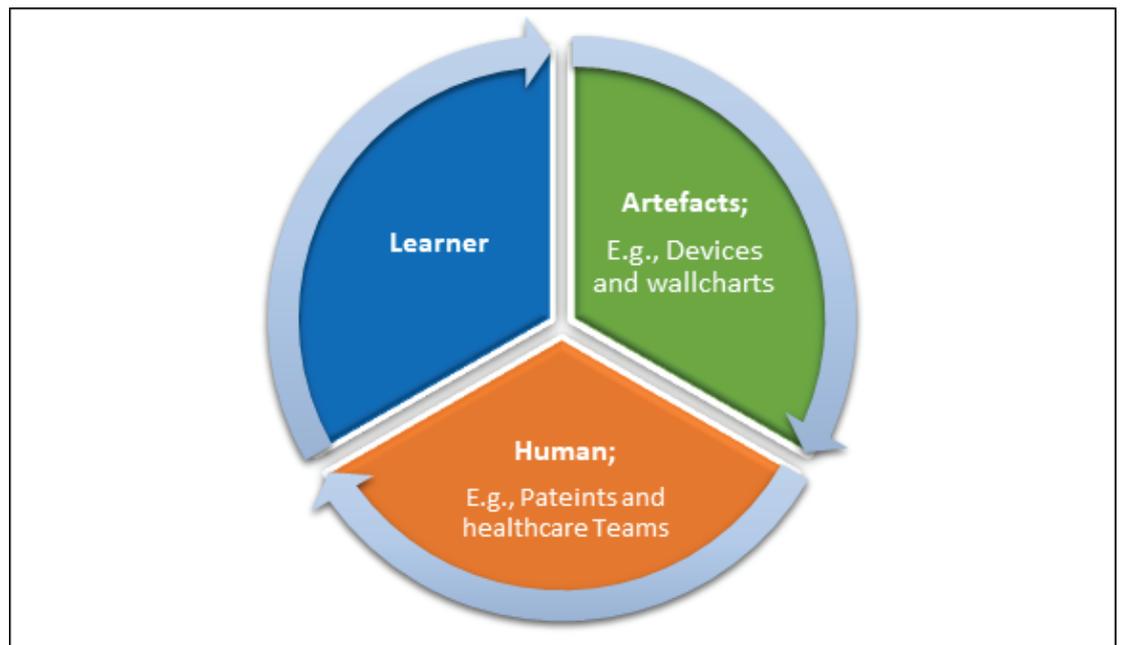

Figure 2: The sociocultural learning orientation.

1.8. Humanisms

The humanistic perspective views learning as a process of the natural development of human beings [15, 26]. It postulates that as individuals grow, they aspire to achieve their full potential and reach their limits in learning to fulfill self-actualization [6, 9, 19, 21]. The motivation to learn is intrinsic to learners who are proposed to have the capability to monitor and judge their learning, which is known as self-directedness [6, 15, 21]. Self-directed learning is integral to humanism and is about the ability of learners to assess their current performance in view of their future learning goals [19, 21, 35, 60]. As such, learners are seen as autonomous who possess the ability of self-assessment to identify gaps in their learning and set out appropriate plans to accomplish their goals [21]. The adult learning theory by Knowles shares some features with the humanistic perspective in that learners are self-directed, problem- rather than subject-oriented, and internally rather than externally motivated to learn [15, 19, 60].

1.8.1. Implications to practice

Implications of humanism to medical education are through critical reflection and feedback, which are the two pillars of self-directed learning [14, 15, 19, 58]. Effective educational interventions should, therefore, include opportunities for self- and peer-assessment exercises, where students are encouraged to judge their performance and that of their peers [60, 61]. In the Pendleton's model of feedback execution, learners are initially encouraged to self-assess their performance and concurrently receive feedback from their peers and teacher, a design that may promote goal setting and self-directed learning [62, 63]. Students should also be accustomed to soliciting feedback on their learning and encouraged to engage in dialogic feedback practices that may enhance their attribute of self-directedness [28, 45, 58, 60].

1.9. Integration of learning theories

Having discussed the tenets of the main learning theories that underpin clinical teaching, it should be mentioned that these theories should be seen as complementing each other rather than singular dimensions (Table 1) [2, 6, 12, 19]. Ordinarily, a teaching strategy may posit more than one learning theory albeit with variable contribution and different perspective [12, 16]. For instance, sociocultural learning in clinical firms involves a behavioral component where students tend to imitate other team members' actions, a cognitive dimension where learners interpret and judge on which actions to be emulated and when, a constructivist root of the creation of new meanings through interaction with peers and teachers, and a humanistic approach where students might be motivated to proceed with their learning as far as it goes (Figure 3). It has been asserted that there is no "*right or wrong way to learn,*" instead, it is more about the consideration of the mechanisms and the conditions under which a teaching strategy may likely work [12, 18, 21]. Consequently, working knowledge of the educational theories might enable teachers to choose the appropriate strategy to enhance students' learning and achieve the expected educational goals [18]. Finally, it should be noted that theory and practice are intimately related and reciprocally inform each other as Spouse (2001) stated, "*Without theory, it is hard to talk about practice and without practice, a theory has no meaning*" [23: p. 519, 15].

2. Conclusion

Clinical teaching is fundamental to graduate physicians capable to serve their communities and educate the coming generations of health practitioners. However, teaching in the clinical environment was often unstructured, opportunistic, and lacks a theoretical foundation. Educational perspectives drawn from learning theories set out such a theoretical framework through which teaching interventions can be appropriately contextualized and tested. Learning theories cater to an armamentarium of educational tools and predict where those will best function and how they can be appropriately evaluated. Clinicians should be cognizant of the principles of the learning theories to

TABLE 1: Summary of the main learning theories and their application in the clinical environment.

Theory	Scope	Examples in the clinical practice	Promoters	Agency	Role of teachers
Behaviorism	Imitation of others' behavior to master skills and achieve competency	•Clinical skills learning •Competency-based education	•Deliberate practice •Feedback •Breaking tasks into smaller parts •Structured clinical skills teaching (e.g., in simulation labs)	Teacher-centered	•Demonstrate behavior •Observe performance •Provide feedback
Cognitivism	Organization of knowledge (cognitive schemas) in the learner's mind to aid understanding and memorization	•Problem-solving •Clinical reasoning •Use of templates and concept maps	•Structured teaching •Provision of working examples •Asking questions to probe understanding	Learner-centered	•Link new knowledge to existing one •Focus on the main concepts and ignore trivial information
Constructivism	Making meaning (assimilation and transformation of knowledge) from interaction with others	Collaborative (dialectic) learning activities, e.g., team- and problem-based learning and case-based discussions	•Discussion and interaction •Reflective practice, e.g., portfolios, logbooks, and reflective journals	Learner-centered	•Facilitate and enrich discussion among learners •Provide engaging and real-world exercises
Sociocultural	Professional growth and Learning to adopt the social identity of a "physician"	•Longitudinal clinical clerkships •Community-based teaching •Shadowing	•Engagement in the patient care duties in the clinical setting •Mutual trust and respect, and good communication	Learner-centered	•Provide opportunities to participate in meaningful activities •Develop effective mentorship and supervision skills
Humanism	Motivation of learners to achieve the goals of their learning and fulfill self-actualization	Self-directed learning	•Self- and peer-assessment exercises •Critical reflection •Soliciting feedback	Learner-centered	•Encourage self- and peer-assessment and provide feedback to enhance learners' goal setting

inform their pedagogical choices and exploit their potential to embrace the identity formation and professional growth of their trainees. Faculty development programs and training of clinical teachers on the application of learning theories in the clinical
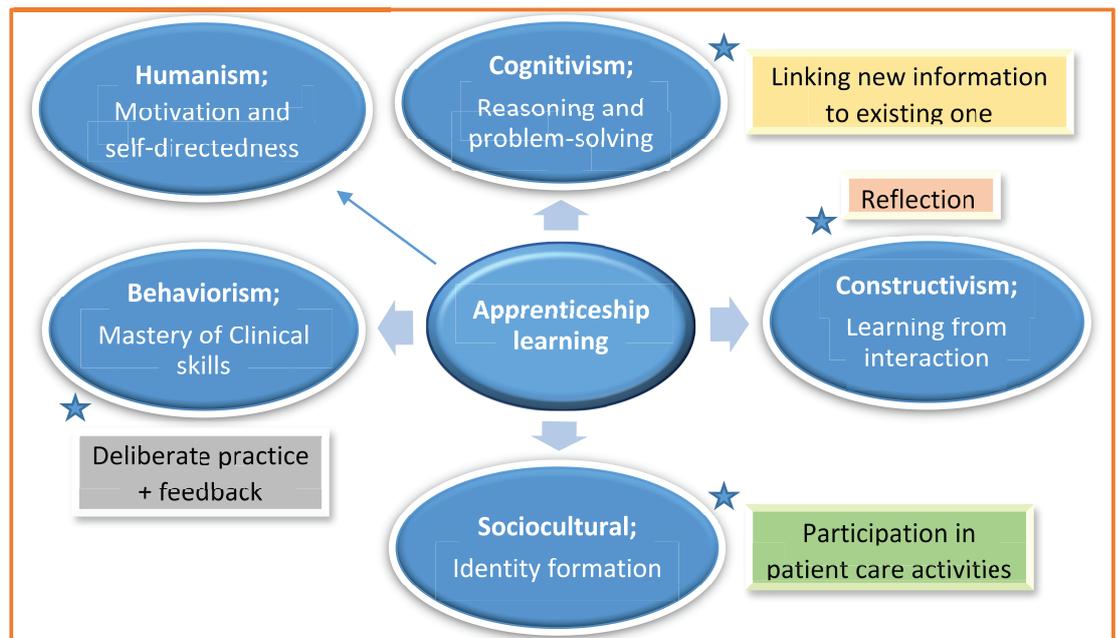
Figure 3: Integration of the learning theories.

context might, therefore, come at the forefront of the agenda of curriculum designers and medical schools' administrations.

Learning theories are not new but worth revisited to emphasize their potential role to enhance teaching and learning in the clinical environment and promote the development of competent physicians. This might be essential particularly in the current era of constantly changing settings and tools of learning and instruction. Elaboration on the application of these theories in the clinical environment may be worth reminding teachers and learners about their importance and set the stage for better outcomes in the field of medicine.

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Conflict of Interest

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