

## Teaching and Learning in the Clinical Environment: Theories, Practice, and Pedagogical Insights

<sup>1,2</sup>Obadeji A., <sup>1,2</sup>Oluwale L. O.

<sup>1</sup>Department of Psychiatry, College of Medicine, Ekiti State University, Ado-Ekiti, Ekiti State, Nigeria, <sup>2</sup>Department of Psychiatry, Ekiti State University Teaching Hospital, Ado-Ekiti, Ekiti State, Nigeria

Corresponding Author: Dr Adetunji Obadeji; [doctunjioaba@yahoo.com](mailto:doctunjioaba@yahoo.com)

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#### Corresponding Author:

Adetunji Obadeji

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### ABSTRACT

Clinical skills remain the bedrock of medical and health professions education. Developing these skills and competencies requires a systematic approach grounded in various theories, principles, and models. This article outlines multiple models that guide the development of curricula, supporting the progression from basic to advanced competencies. These frameworks help define learning objectives at different stages of clinical skill development. Learning theories, in contrast, explain how these skills are acquired. The behaviourist approach emphasises the importance of feedback, enabling students to identify their strengths and areas for improvement. Effective feedback helps learners gauge their current performance and identify steps to reach expected levels. The cognitivist approach highlights the role of mental processes—such as attention, concentration, and memory—in promoting active participation. Teaching methods should foster critical thinking and clinical reasoning, ensuring full engagement from all students. Social learning theory, on the other hand, highlights the significance of observation and role modelling, while constructivism emphasizes the importance of prior experiences and reflective thinking. Rather than being treated as "blank slates," learners should be seen as individuals with existing knowledge to build upon. By understanding the theories and models that underlie clinical skills acquisition, educators can better optimize teaching and learning opportunities.

**Key words:** Clinical learning environment, learning theories, curriculum models, learning objectives, Clinical skills

### 1. INTRODUCTION

Clinical skills remain the heart of medical education.<sup>1</sup> Nonetheless, there is no specific definition for clinical skills in the literature. According to the Scottish Clinical Skills Network, clinical skills can be defined as "any action performed by staff involved in the direct care of the patient, which impacts on the clinical outcome in a measurable way". These include cognitive or 'thinking' skills (such as clinical reasoning and decision making), non-technical skills (such as teamwork and communication), and technical skills such as clinical examination and invasive procedures.<sup>2</sup> These skills, including interpersonal and communication skills, are effectively developed through bedside teaching, clinic settings, or in a simulated environment where patients are available. It is best achieved through an integrated longitudinal education process where a student is exposed to increasingly challenging skills over time.<sup>3</sup>

The primary goal of learning clinical skills is to improve patients' outcomes through the quality of care provided by physicians or other healthcare workers.<sup>4</sup> This, however, is based on the ability to effectively apply clinical skills and not just the basic medical sciences learned. Encounters with patients provide opportunities to apply both cognitive and technical skills, as well as other components of clinical skills.

Based on the Undergraduate Medical Education (UME) recommendations, students must possess 12 clinical competencies<sup>1</sup>. First, they must possess the ability to demonstrate ethical behaviour and professionalism in medical care. They must possess the ability to communicate with patients and develop patient-student relationships, in addition to being able to communicate effectively with others. Additionally, they must be able to apply scientific knowledge and methods to solve clinical chal-

lenges. Upon critical examination of the above qualities, it becomes evident that these are inherent in students before their clinical education but require development. In addition to the above inherent competencies, they must be able to take clinical history and carry out both physical and mental state examinations. They should be able to select appropriate clinical investigations and justify the reason or reasons for these choices. Alongside these, they must be able to understand and perform a variety of basic clinical procedures, record them, present them to their peers and teachers, as well as manage clinical information. They should also possess the ability to diagnose and discuss clinical problems, including their aetio-pathogenesis. In addition, clinical students should be able to understand and devise appropriate interventions based on the cause and course of the disease. Based on their understanding of the patient and the course of a disease, they should be able to formulate a prognosis and provide clinical care based on patients' socio-demographic correlates. With the knowledge of these competencies, it will be easy to devise appropriate teaching and learning strategies and methods for teaching clinical skills.

There are factors in the learning environment that may interfere with the degree to which a student will learn these skills. Some of these factors are inherent in the student (i.e. the internal environment) and some are external factors. Students in our classes today vary in terms of socioeconomic, emotional, or psychological state, as well as physical and health status<sup>5,6</sup>. Differences also occur in terms of their motivation, prior knowledge, and intellectual abilities. Intrinsic psychological factors such as students' willingness to take risks, concentration and attention spans, levels of resilience, attitudes, beliefs, and assumptions are other inherent factors to consider<sup>6,7</sup>. Extrinsic factors or external environment, such as concern about comfort (e.g. temperature of the class, noise), level of illumination, and level of distraction, are important factors that influence the degree to which clinical skills are learned<sup>8,9</sup>. A little distraction or change in room temperature may affect students' ability to concentrate and, hence, their ability to learn. This may be a concern in some developing nations where electricity is not readily available or in situations where clinical teaching sessions are characterized by crowded students. Such environmental variables can go a long way in determining a student's ability to learn<sup>9</sup>. It's important to know as educators that students come with multiple perspectives to any learning situa-

tion, either as a result of their gender, ethnicity, class, age, sexuality, or physical ability<sup>5</sup>. All these affect the extent to which a student learns in each situation. As clinical teachers, these factors must be considered to ensure effective teaching and learning.

While medical teachers are experts in clinical skills, many lack adequate preparation in educational methods. Gaining knowledge of effective teaching and learning approaches in teaching clinical skills is therefore crucial to enhance the quality of instruction, foster active learner engagement, and promote the development of essential professional competencies among students. This narrative review aims to equip clinical teachers with a comprehensive overview of the principles and theories that inform teaching and learning within the clinical environment, and to outline evidence-based approaches for enhancing the quality of clinical teaching and learning encounters.

## 2. APPROACHES TO TEACHING CLINICAL SKILLS

Several approaches to teaching clinical skills have been described in the literature. These include Peyton's Four-Step Approach (demonstration, deconstruction, comprehension, and performance), Direct Observation and Feedback Models such as Mini-CEX and DOPS, which integrate teaching with formative assessment, as well as Case-Based Learning, the One-Minute Preceptor, and SNAPPS. The SNAPPS and One-Minute Preceptor models, often used in time-limited teaching encounters, are discussed in detail below, while other approaches are presented under the section on settings for teaching clinical skills.

### 2.1 One-Minute Preceptor

The One-minute preceptor for teaching clinical skills consists of five tasks or micro-skills (figure 1) that one attempts to achieve when discussing a clinical case presented by the trainee<sup>11</sup>. These include (i). Getting a commitment from the learner, (ii) Probing for supporting evidence to substantiate or rule out his commitment, (iii) then, the preceptor teaches the general rules, (iv) the preceptor reinforces what was done right, and finally (v) the preceptor corrects mistakes made by the student.

The first micro-skill is used immediately after a patient has been presented to the teacher or the preceptor. To obtain a commitment from the learner, one may ask a specific question, such as "What do you think is going on with your patient?" or "What do you want to do for this patient?" This question enables the learner to process the information they have just collected regarding the patient's health issue. At times, there may be a need to ask one or two questions about the presentation to clarify certain points before requesting a commitment. As a follow-up on the learner's commitment, the preceptor then asks for supporting evidence to substantiate or refute their claims. For example, one may ask, "What led you to that conclusion?" or "Why not the other way round?"

Having an idea of what the learner knows, the preceptor teaches one or more general rules, targeting both the current case and those that can be generalised to other or similar cases. These rules may encompass essential features of a particular disorder, criteria for making a diagnosis, or management strategies for patients with such conditions. The extent of such a general rule will depend on the extent of knowledge of the learner and the time available for the discourse.



Figure 1: One-Minute Preceptor

In concluding the steps, it is essential to reinforce what was done correctly and address mistakes, i.e., providing appropriate feedback. This engagement provides the opportunity to reinforce highly effective approaches and suggest a new approach that may be helpful in the future. For example, one can say, "You did a good job of putting the history, physical and mental state examination findings together, in an organized and coherent way". Another approach is to ask the learner to identify what was done right and what they would like to do better. Some positive feedback can be given early in the teaching, immediately after presenting the patient, or before probing for supporting evidence. This may help in reducing learners' performance anxiety. The one-minute preceptor has been described as a simple, flexible, and experiential approach that can be adopted by preceptors and learners during encounters with patients, either in the outpatient or inpatient setting<sup>10</sup>.

## 2.2 The SNAPPS MODEL

The SNAPPS (figure 2) is an acronym for Summarize, Narrow down, Analyze, Probe, Plan, and Select a case-related problem for self-directed learning. This model provides a learner-centered, outpatient approach to teaching clinical skills<sup>11,12</sup>. As in a one-minute preceptor, the steps take place after a learner has interviewed the patient. The learner then summarizes the history and the findings of the physical and mental state examination, narrowing down the differential diagnoses to two relevant possibilities. He or she now analyzes the differential by comparing and contrasting the possibilities based on the evidence available from the history, physical and mental state examination. Subsequently, the learner is allowed to probe the teacher by asking questions about uncertainties, difficulties, or alternative approaches. He then plans the management of the patient's medical problems based on his findings, and finally, a case-related problem is selected for self-directed learning. This may be a concept that the learners did not understand well, or it may be something that can improve their understanding of the case presented.

## 3. SETTINGS FOR TEACHING AND LEARNING CLINICAL SKILLS

### 3.1 Bedside Teaching

Various patient care settings provide students with opportunities to develop clinical skills. One major setting is the bedside, usually within inpatient care. Bedside teaching remains a fundamental component of medical training, allowing for clinical instruction in the presence of the patient. It provides an avenue to learn clinical skills such as the art of communicating with patients, techniques in obtaining a history and physical examination, clinical reasoning, and professionalism<sup>13</sup>.

Clinical teaching using a 'real patient' has been shown to have some advantages<sup>13,14</sup>. One such example is that, if properly structured, students are motivated by the relevance of their learning experiences. They can appreciate the significance of the theoretical aspect of their study. As we know, the primary reason for studying is to become a doctor or a health professional. As such, the opportunity to learn with a live patient is a great experience. Besides, learning with a 'real patient' provides a comprehensive approach to care, integrating theory, clinical skills, and the necessary attitude for effective clinical care. It also offers an opportunity for role modelling, professional thinking, teamwork, and integrated

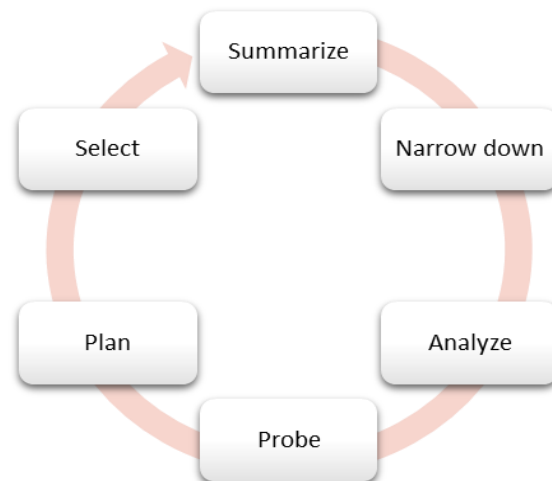


Figure 2: The SNAPPS Model

communication skills<sup>14</sup>.

However, several hindrances to effective bedside teaching exist, including a high student-to-teacher ratio, crowded classrooms, a lack of preparedness and interest, and an increase in administrative and research work among medical teachers<sup>15</sup>. These impede the quality teaching and learning of clinical skills through this means, hence the need for additional strategies. Other factors, such as the student's gender, the patient's religion, and other cultural practices, may hinder the effectiveness of bedside teaching<sup>16,17</sup>.

In addition to the bedside, outpatient clinics such as acute care, chronic care, critical care, emergency care, and population/community-based clinics provide numerous opportunities to learn. And despite the importance of using 'real patients', some authors have questioned the ethical implications of such<sup>14,18</sup>. In most developed nations, bedside teaching is usually supplemented with a clinical skills center. Nonetheless, bedside teaching remains the only alternative in most resource-limited countries like ours due to the unavailability/limited availability of other practicable methods. Furthermore, outpatient settings are often limited by the short time available for teaching; therefore, innovative approaches such as the One-Minute Preceptor and SNAPPS can be effectively utilized.

### 3.2 Clinical Skill Laboratory

Simulation creates an important avenue for teaching and learning of both basic and advanced clinical skills<sup>19</sup>. To optimize simulation-based learning, the availability of simulators, including high-fidelity mannequin-type simulators or virtual-reality simulators, as well as full-time faculty and instructors, is essential in a clinical skills laboratory<sup>20</sup>. It provides an opportunity for students to practice clinical skills repeatedly with no risk or inconvenience to the patient. As we know, repetition aids learning, and learners with seemingly lower intellectual ability who do not grasp things easily are provided with opportunities to catch up with their peers. Once the skill is mastered, students are better equipped to perform it on patients. Limited facilities for simulation are a significant impediment to the quality of teaching and learning of clinical skills in resource-limited countries. In most cases, acquisition of clinical skills is limited to experiences with 'real patients' and consequently limit their exposure to only patients that are available during their clinical rotations.

### 3.3 Small Group Sessions

Small group sessions, seminars, and workshops offer opportunities for students to actively engage in the teaching and learning of clinical skills<sup>21</sup>. This can be achieved through interactive sessions with opportunities for skill practice and formative feedback<sup>22</sup>. Small groups of 8 or fewer can provide an opportunity to learn communication skills, both verbal and non-verbal. Specific clinical skills cannot be effectively demonstrated in a large group, and small group sessions provide an opportunity for students to learn. Nevertheless, the lowest student-to-teacher ratio should be pursued to allow for more time for individual learning and practice. In resource-limited settings, opportunities for this are limited due to the low instructor-to-student ratio, and what is supposed to be a small group session ends up being large. Hence, some students with certain traits; low self-confidence, or timid ones may not engage in such sessions.

The small group discussion enables learners to engage actively in a discussion, providing an opportunity to receive feedback, reflect on the topic, consolidate their learning, clarify issues, and explore ideas and concepts. The teaching and learning process builds on and relates activities to learners' prior knowledge and experience. This allows for the active participation of learners, and ensures that the learning experience relates to the perceived needs of the participants. Besides, small group discussion enables group interaction and promotes critical thinking and problem-solving<sup>23</sup>.

In a small group discussion, the teacher's role is that of a facilitator of learning. They lead discussions, ask open-ended questions, guide processes and tasks, and facilitate active participation and engagement with ideas among learners.

## 4.0 INSTRUCTIONAL STRATEGIES FOR TEACHING CLINICAL SKILLS

### 4.1 Problem-Based Learning

Problem-based learning (PBL), on the other hand, provides a learner-centered approach to learning clinical skills. Learners re-structure information they already know or gain new knowledge, and also elaborate on the new information they have learned, either by teaching it to colleagues or discussing the material in a group setting<sup>24</sup>. In PBL, students work in small groups to study written descriptions of clinical situations or scenarios using a specific set of study skills. Such scenarios guide them toward the development of relevant theoretical and clinical skills and knowledge. It provides an opportunity to construct new knowledge through collaboration with peers. The success and effectiveness, however, depend on the motivation and the degree of involvement of its participants<sup>25</sup>.

### 4.2 Case-Based Learning

Case-based learning (CBL) is an instructional strategy based on constructivist learning theories. It is a collaborative, inquiry-based learning approach that uses real-life or simulated scenarios to encourage learners to think critically, engage their problem-solving skills, and apply theoretical knowledge<sup>26-28</sup>. It shifts focus from rote memorization to an active exploration of real-world challenges, thus making learning meaningful and applicable.

In CBL, cases reflecting the complexities of real-life situations are

presented as narratives or scenarios that present a dilemma or problem requiring resolution<sup>26,27</sup>. Learners are tasked with analysing the case, identifying the issues, gathering relevant information, and providing evidence-based solutions. Besides enhancing the understanding of the subject matter, it also cultivates skills such as teamwork, communication, and decision-making in the students.

A key advantage of CBL is its ability to bridge the gap between theory and practice, thus adequately preparing learners to address real-world problems or clinical scenarios<sup>26</sup>. It immerses students in contexts where knowledge will be applied, reinforcing their understanding while demonstrating the relevance of their studies. Besides, it fosters active engagement and collaboration, improved retention of knowledge, enhanced problem-solving abilities, and greater confidence in applying skills.

### 4.3 Self-Directed Learning

Learning clinical skills can also be facilitated through self-directed learning. For example, written resources can help students understand the background knowledge required to demonstrate a skill at the bedside or in a simulation session. These can be in the form of reading textbooks on physical examination, history taking, or other relevant literature. Video and audio recordings can also provide platforms for learning clinical skills. Relevant skills or skills to be learned, e.g. interviewing techniques, clinical examination, or other skills, can be recorded and made available to students for self-directed learning. Besides, different online resources can be relevant in learning desired clinical skills or techniques. However, the availability of materials and access to effective and efficient internet may limit the usage of such facilities in a developing economy.

## 5.0 MODELS FOR DETERMINING CLINICAL SKILLS LEARNING OBJECTIVES

Several models provide frameworks for determining competencies learners should develop and offer developmental approaches to teaching clinical skills. As students progress in their training, they are expected to take on more complex roles. The most notable models include Pangaro's RIME schema, Miller's pyramid, and the Dreyfus competency model<sup>29-31</sup>. These are discussed further below.

### 5.1 Pangaro's RIME Schema Framework

Pangaro's RIME schema framework (figure 3) is a development model that describes the progression of a learner's clinical role<sup>31</sup>. This framework enables faculty to assess learners' levels and tailor expectations accordingly.

The first stage of the model is "Reporter," where students are expected to gather and report clinical information. The second stage, "Interpreter," requires students to analyse the information they've collected. As "Managers," learners are expected to formulate diagnostic and therapeutic plans, making decisions based on priorities and options. Finally, as the "Educator", students are expected to teach others and support their statements with evidence. As learners move through these four stages, they expand their



Figure 3: Pangaro's RIME Schema



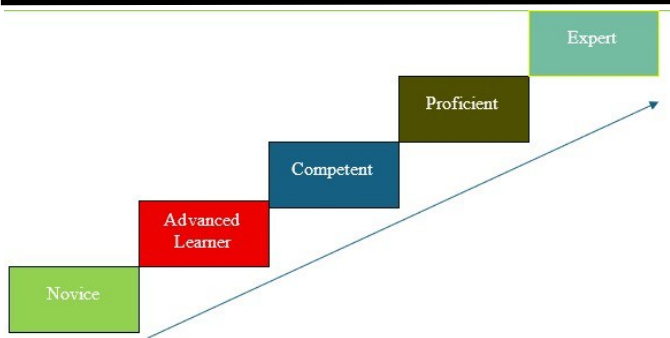


Figure 5: Dreyfus Model

knowledge and develop their clinical reasoning skills. This schema can guide the development of a clinical curriculum based on the level of clinical education.

## 5.2 The Miller Pyramid

The first level, "Knows" (Figure 4), represents the ability of a learner to demonstrate knowledge of skills. The second level, 'Know How', signifies that the learner knows how to perform the skill, whereas in the third stage, "Show How", the learner demonstrates their ability to perform the skill. In the final stage, the "Does" stage, learners demonstrate the ability to execute the skill in a real clinical setting. Most of these skills are learned concurrently, and separating clinical roles into four stages can be challenging. Nonetheless, this model helps educators develop clear learning objectives for different levels of medical education.

## 5.3 Dreyfus Model

Dreyfus's model of skill acquisition (figure 5), however, enumerates how students acquire skills through formal instruction and practice<sup>29,33</sup>. The Dreyfus model is used in providing a means of assessing and supporting progress in levels of skills development or competencies, and an opportunity for defining acceptable levels for competence or capability assessment. He described a five-stage model, ranging from the novice stage, where a learner follows rules without exercising any sense of discretion or judgment, to the advanced learner stage, then through the competent and proficiency stage, and finally to the expert stage. The 'expert' level does not signify that development stops, but rather the need to evaluate one's practice and keep track of new evidence. Developmental clinical learning objectives that allow learners to move gradually from a novice to an expert can be developed based on this model.

## 5.4 Bloom's Taxonomy

Clinical skills learning objectives can be categorized using Bloom's taxonomy, as illustrated in Figure 6. This taxonomy organizes learning goals hierarchically, ranging from simple to complex tasks<sup>34</sup>. Typically, learners must master each level before progressing to the next. This sequential structure is essential for designing developmental curricula, guiding learners from basic to advanced competencies.

Bloom's taxonomy includes six levels: knowledge, comprehension, application, analysis, synthesis, and evaluation. The learner needs to demonstrate knowledge and understanding of a task before being able to apply it. Unlike models that focused primarily on psychomotor skills, Bloom's taxonomy emphasizes a cognitive approach to acquiring clinical skills. Learners must gain an understanding of skills before they can analyse or synthesize to arrive at a definite inference. It plays a critical role in fostering clinical rea-

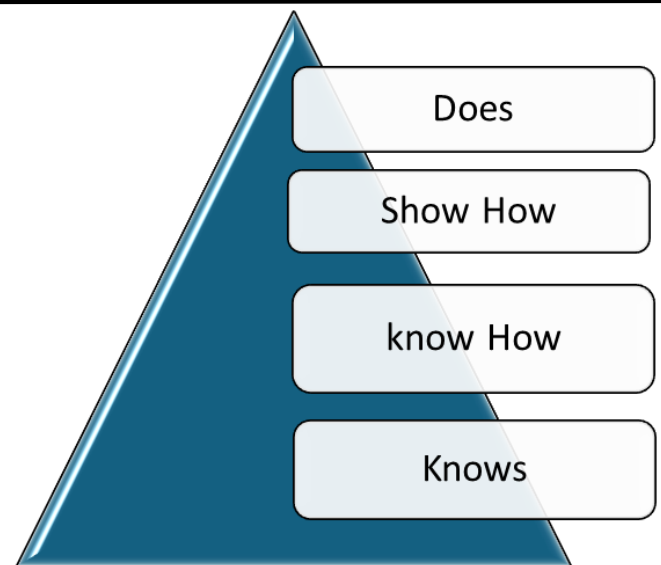


Figure 4: The Miller's Pyramid

soning and diagnostic abilities<sup>35,36</sup>. The complexity of the learning objective determines the corresponding level of Bloom's taxonomy, where learners are expected to operate<sup>32</sup>.

# 6.0 LEARNING THEORIES AND CLINICAL SKILLS' ACQUISITION

## 6.1 Adult Learning Theory

Adult learning theory is an important construct upon which the teaching and learning of clinical skills can be based. According to Knowles et al,<sup>37</sup> there are significant, identifiable differences between adult learners and learners under eighteen. Adult learners often have prior experience and are self-directed; they have a valuable resource for learning and are usually internally motivated to learn things that are immediately relevant to their needs. Understanding how adults learn best can inform the choice of approach to teaching and learning in a clinical environment. Providing a facilitated clinical session or an environment that allows each learner to contribute freely and receive constructive feedback goes a long way in maximizing learning opportunities. Again, each clinical teaching and learning opportunity should have clearly stated objectives that are relevant to the students' training or needs.

## 6.2 Experiential Learning Theory

Experiential learning, as shown in Figure 7, depicts an approach to teaching clinical skills. In this approach, knowledge and skills are acquired through active engagement and reflection<sup>38</sup>. It entails students being actively involved in learning experiences rather than being a repository of ready-made knowledge, as occurs in didactic lectures. According to Kolb, there are four stages represented as a continuum<sup>39</sup>. The first step is the concrete experience, where the individual experiences the actual event either by observing or watching a procedure. Secondly, an opportunity to reflect and conceptualize the experience is created. Subsequently, he applies the experience in a new situation, i.e., an opportunity is created for the student to practice or demonstrate what they have learned. The observations and reflections are then synthesized into a new conceptual understanding and interpretation of the experience<sup>38</sup>. This learning approach can be relevant in learning clinical skills. For example, in the examination of the respiratory system involving auscultation, students can be allowed to listen and appreciate how normal breath sounds differ from abnormal

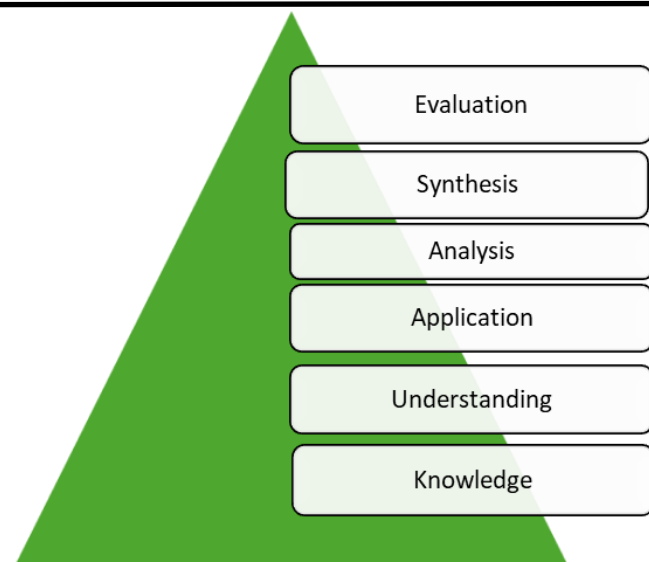


Figure 6: Blooms' Taxonomy

sounds. He then reflects on it, conceptualizes it, and then practices it in another situation. This appears to be an effective approach to conceptualizing knowledge and acquiring skills, however, where there are many students at the bedside or in the clinic, many students may not have the opportunity for concrete experience let alone reflect on the experience.

### 6.3. Constructivism

The acquisition of clinical skills can be explained through the constructivist theory of learning, which views learning as an active process where learners build new ideas based on their existing knowledge<sup>40,41</sup>. The effective application of this theory requires an understanding of students' current level of knowledge and their previous experiences, enabling them to create personal meaning when encountering new information. Learners are not regarded as "blank slates" but as individuals who bring prior experiences and socio-cultural influences to new learning situations.

However, one challenge lies in assuming that all students have relevant background knowledge, as it can be challenging to assess the quantity and quality of their prior experiences. Providing opportunities for active participation, hands-on practice, and the application of critical thinking skills helps learners derive meaning from their experiences, considering their existing knowledge. While constructivism has been criticized for its perceived vagueness, it remains recognized as one of the most effective approaches for teaching and learning<sup>42</sup>.

### 6.4 Social Learning Theory

Learning clinical skills is like an apprenticeship; you learn by observation or modelling. This exemplifies social learning theory. The student learns from his superior teacher or peers through observation, imitation, and modelling<sup>43</sup>. Clinical interview, examination and communication skills can be learned through this approach. Nevertheless, for effective learning, attention, memory, and motivation need to be activated. Learning clinical skills through this means may not be effective in environments with multiple students at the bedside, in groups, or with distractions in the student's internal or external environment.

### 6.5 Behaviourism

The behaviourist approach to clinical skill learning emphasizes observable behaviours, often at the expense of cognitive processes<sup>44</sup>. Behavioural change occurs through the reinforcement of a

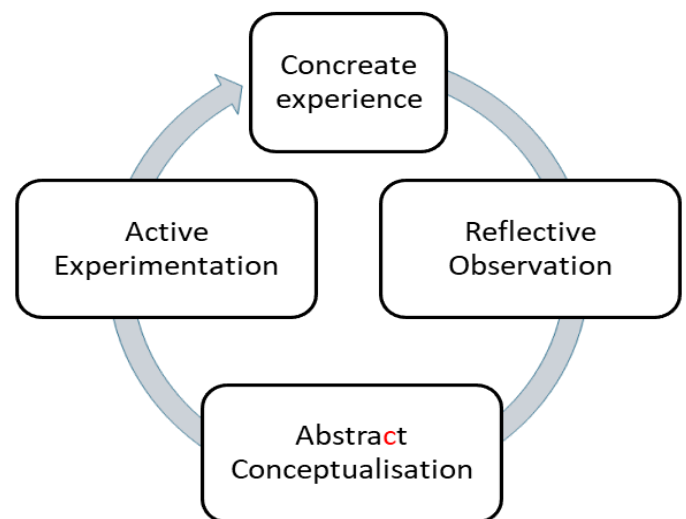


Figure 7: Experiential Learning Cycle

stimulus and the provision of feedback. When a behaviour is rewarded or reinforced, it is more likely to recur. This approach clearly defines the specific skill or procedure a learner is expected to perform and the conditions under which it should be performed. For example, in the case of a patient with lobar pneumonia (the condition), the learner might be expected to accurately elicit clinical signs (performance) with 80% accuracy. Reinforcing correct actions based on set objectives increases the likelihood of repetition, and correcting errors reduces the frequency of mistakes<sup>45</sup>. This approach is commonly used in designing learning objectives or competency-based curricula, particularly for developing clinical skill instruction and simulated case scenarios. Feedback plays a crucial role in this process, helping to reinforce correct behaviours and address mistakes, which encourages learning by promoting positive behaviours over time<sup>46</sup>. The provision of feedback enhances the learning experience, helping to narrow the gap between actual and desired performance.

### 6.6. Cognitivist Learning Theory

The cognitivist approach emphasizes the learner's use of internal cognitive structures, such as insight, perception, memory, and information processing, to facilitate learning by assigning meaning to experiences<sup>47,48</sup>. These are influenced by external and internal factors that influence one's attention and concentration. Ensuring active participation and engagement, with an opportunity to reflect or engage in critical thinking, helps to maximize learning through this approach. The individual learner and their thought processes are central to achieving meaningful learning through this approach. The teacher's role is to support the learner in acquiring and processing information effectively<sup>48</sup>.

However, this approach has limitations, as it does not address how individuals with less developed cognitive abilities or varying learning preferences can learn effectively. While it focuses on cognitive processes, successful learning also requires the learner's attention to remain unimpeded. Consequently, the learner's internal and external environments play crucial roles in enabling effective learning through this approach.

### 6.7 Situated Learning

Situated learning is a comprehensive theory of knowledge acquisition, emphasizing that skills are best learned within the context in which they will be applied. This approach is particularly relevant to

technology-based learning activities that focus on problem-solving skills. It suggests that students acquire skills more effectively when learning occurs in authentic, real-world environments. For instance, clinical skills can be taught and learned in outpatient clinics through practical interactions with patients.

According to Lave and Wenger (1991),<sup>49</sup> situated learning involves the gradual progression of knowledge and expertise from novice to expert within the context of everyday activities. This theory underscores the importance of presenting knowledge in its natural context, such as clinics, hospital wards, or emergency centres, where learners can directly apply the skills they are acquiring.

### 6.8. Deliberate Practice

Another concept that explains the process of learning clinical practice is deliberate practice. This approach emphasizes focused attention, sustained concentration, effort, and repetition of skills until proficiency is achieved<sup>50</sup>. This is facilitated by encouraging active participation in small groups, ensuring that every member can engage. Usually, tasks are broken down into their component parts to reduce cognitive load and make the learning process more manageable for students.

Close observation and feedback based on clearly defined objectives are key components of deliberate practice. These elements help students identify and focus on their strengths and weaknesses, enabling targeted improvement<sup>51</sup>. Furthermore, the learning experiences were systematically organized and logically sequenced, guided by well-defined objectives and meaningful theoretical frameworks. This structure supported both formal and informal learning opportunities, ensuring they were appropriately aligned with the students' stage of intellectual development.

### 6.9. Application of Various Models and Learning Theories

Medical education is undergoing continuous transformation to meet the evolving demands of stakeholders. Modern medical graduates are expected to fulfil multiple roles beyond clinical expertise, necessitating a curriculum that reflects these roles and facilitates the acquisition of essential competencies<sup>32</sup>. A thorough understanding of the models and theories underlying clinical skills acquisition is critical to achieving this goal.

The previously discussed models provide a framework for developing curricula that guide learners from basic to advanced competencies. These models help define learning objectives at each stage of clinical skill development. For instance, the Pangaro RIME framework outlines the learner's progression through various roles: reporter, interpreter, manager of clinical information, and educator, which aligns with Miller's Pyramid levels: knows, knows how, shows how, and does.

Such models enable educators to identify the learner's role at different stages and the corresponding clinical skills they should demonstrate. Additionally, these frameworks support the design of effective assessment strategies to evaluate the learner's knowledge and competencies at each level.

Learning theories provide insights into how clinical skills are acquired. The behaviourist approach highlights the significance of feedback in every clinical encounter, emphasizing its role in reinforcing good performance and motivating students to improve. It also underscores the potential negative impact of critical feedback if not delivered constructively. Feedback is crucial for helping learners understand their current level of competence and what steps are needed to reach their expected level of performance.

In contrast, the cognitivist approach focuses on the role of cognitive processes such as attention, concentration, thinking, and memory in fostering active and engaging learning experiences. Bedside teaching and other clinical skills opportunities should aim to involve all students, encouraging critical thinking and clinical reasoning. However, ensuring active participation becomes challenging in settings with large groups, such as classes or groups of 30 or more students. Despite these challenges, efforts should be made to ensure that all learners can actively engage and benefit from these experiences.

Similarly, social learning theory emphasizes the relevance of observation or role modelling in learners. Clinical teaching, such as bedside teaching, should be organized in a way that allows every student to observe clinical skills being demonstrated or taught, as this provides students with opportunities to observe their teachers as they demonstrate clinical procedures. The constructivist approach focuses on the importance of active engagement in ensuring learning opportunities are maximized. The importance of prior experience and reflective thinking was emphasized in the constructivist approach. A learner should not be seen as an 'empty slate' but as one possessing prior experience to build on.

### Conclusion

The acquisition of essential clinical skills remains a cornerstone of medical education. Various skill-learning models and approaches provide a foundational framework for understanding how clinical skills are acquired, while also highlighting the unique ways in which adult learners engage with the learning process. By considering the diverse factors that influence learning and the different approaches to clinical skills training, an eclectic or flexible approach should be adopted for both teaching and curriculum design.

An effective approach should prioritize practical exposure while creating opportunities for reflection and clinical reasoning. Such a balanced strategy is more likely to foster meaningful and effective learning outcomes.

### Authors' Contributions

**AO:** conceptualized the review, conducted the literature search, and drafted the initial manuscript.

**AO and LOO:** contributed to the selection and critical appraisal of the included studies and revised the manuscript for important intellectual content.

Both **AO** and **LOO** were involved in synthesizing the findings and contributed to manuscript editing and formatting. All authors read and approved the final manuscript.

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