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REVIEW ARTICLE

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# Strategies to Improve Active Learning in Medical Education at Institutional and Individual Levels

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## Abstract:

Active learning is an approach to educational instructions that actively engages involved students with the learning process. In medical education, this approach places a greater degree of responsibility on the learner than passive approaches such as didactic lectures. However, the guidance of the professional medical educator remains crucial to all active learning activities. In the medical curriculum active learning has been defined more broadly to include all activities that are involved in information gathering and problem solving whether individually or in a group. It provides opportunities for the learner to acquire knowledge and skills in meaningful, often natural contexts, and students should be encouraged to actively participate in class. The biggest advantage for active learning is that students develop the power to think for themselves, which leads to better teaching and learning achievements.

In order to effectively prepare medical students to meet the demands of future practice, medical schools must find creative ways to qualify students with the necessary knowledge and skills that enable them to perform effectively after graduation, in an authentic learning context. Multiple strategies at institutional or individual levels aim at developing skills that include collaborative learning, critical thinking, clinical reasoning and problem-solving. In this article, different strategies that are used to enhance active and self-

directed learning at both the institutional and individual instructor level will be discussed. Strategies discussed will include problem-based learning, community-based education, team-based learning, case-based learning, interactive lecturing and flipped classroom.

## Key words:

Active learning, Student engagement, student-centered, facilitator, small group

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## Introduction:

The traditional medical education paradigm has often included teaching using direct instructions by the expert teacher with no or minimum role of the students in the teaching and learning process. Passive learning is associated with teacher-centered approaches and requires students to learn primarily by watching and listening to lectures delivered by teachers. Although it helps in conveying a lot of information to large numbers of students, traditional teacher-centered approaches do not lead to the desired levels of learners' acquisition and achievements (1 & 2). In fact, this didactic approach in teaching and learning has been found to be the least effective method of education that is unlikely to enable

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medical students to become efficient life-long self-directed learners. As a result, medical education experts have suggested a paradigm shift from that teacher-centered model to a more student-centered one. This educational model is different as it considers the students' role to be the main role throughout the teaching and learning process. In student-centered approaches, students are encouraged to fill in knowledge gaps they identify on their own to subsequently incorporate into a network of understanding, creating a real-world knowledge and skills framework through which they can construct a meaningful educational experience (1 & 2).

Active learning strategies have gained widespread recognition in educational settings for their potential to enhance student engagement and critical thinking skills. However, their implementation is not without challenges and criticisms. One significant concern is the perceived time constraints associated with active learning. Different studies highlighted that instructors often face resistance when attempting to incorporate interactive elements into their modules due to the perception that such approaches may extend beyond the time traditionally allotted for the didactic teaching. This challenge emphasizes the importance of drawing a balance between active learning and the need to cover a prescribed curriculum within given time constraints (3).

Resistance to change is another notable obstacle in the adoption of active learning strategies. Faculty members accustomed to traditional lecture-based approaches may find it challenging to change to a facilitative role that resists the tendency to act as an expert and allows more student engagement and participation. Additionally, students, accustomed to passive learning, may resist a shift to a more active role in their education. The reluctance to depart from established teaching norms and customs can impede the successful integration of active learning strategies and necessitate comprehensive organizational strategies for faculty development and student orientation (4).

Furthermore, the issue of unequal participation in group-based activities poses a potential drawback to active learning. This imbalance can hinder the collaborative and inclusive nature of active learning strategies, and emphasizes the need for instructors to employ effective facilitation techniques that encourage equitable participation among students. These challenges underscore the importance of addressing both instructor and student perspectives in the design and implementation of active learning initiatives to optimize their effectiveness in diverse educational contexts (5).

### **Definitions of active learning**

Active learning is defined as learning that requires students to be positively engaged in the learning process by considering, analyzing, synthesizing, and evaluating their learning activities. The essential elements of active learning include the learner's cognitive involvement, and participation in the creation of new information through

meaningful learning experiences, and collaboration with other students while they are learning (2).

It should be stressed that a clear understanding of the active learning process is fundamental to achieve effective teaching and learning. Metacognition, i.e., thinking about thinking or learn how to learn, enables students to take control of their own learning by setting goals, designing plans and monitoring learning progress. It is an assessment by the students, as well as the educators, of how information is being processed and constructed or synthesized into facts that have meanings. (6)

In active learning students are engaged in "doing things and thinking about what are they doing". It has the benefit that students are using their higher-order thinking skills, such as analysis, synthesis, and evaluation. The concept of experiential learning, is an associated concept in which students actively learn from relevant experiences provided in their instructions (7).

There has been a rising interest during the last two decades regarding curriculum reform in medical education both in the developed and in the developing countries. This tendency has been associated with the development of concepts and approaches that aim at the graduation of physicians who are better equipped to meet the needs of the community which they will serve at **individual** and **institutional** levels. Concepts such as student-centered learning or other innovative educational strategies are sometimes applied to curricula without a full understanding or feeling for the curricular process and what needs to be achieved (8, 9).

### **Educational psychology and theory behind active learning:**

There are several theories of adult learning that explain active learning. Active learning encompasses four main requirements: activating previous knowledge; engaging learners; encouraging learner metacognition, considering reflection; and providing students with feedback. Scaffolding is a structural process by which medical educators guide students towards effective independent learning, and is particularly important for the study of medicine, where the subjects are complex and voluminous. However, meaningful learning depends on learners having an appropriate foundation of prior information upon which to build more sophisticated and applicable knowledge and develop necessary skills. Building the critical and important guiding scaffold demands reasoning and critical thinking from both tutor and students, as learners choose to collect additional relevant knowledge by being able to conjure up ideas connected to their foundational knowledge. This process is referred to the "constructivism theory" of learning in which learners can actively create relationships between new and preexisting information (10).

**Self-directed learning (SDL)** is the epitome of active learning, and is a procedure by which students "control their own learning process from beginning to end". Accordingly, study skills are a fundamental component



of SDL, that should be viewed as important transferrable skills. SDL mandates that learners progress through multiple steps that constitute a cyclical process as more information become necessary (11).

### **Student engagement:**

Student engagement is recognized as an essential element of learning in medical schools and is also the core of active learning. Students who engage more learn more (12). Medical educators play an essential role in stimulating the engagement of their students. They can motivate, monitor and guide their students through the learning process. For medical educators to be effective in improving students' engagement, they need to understand the concepts of engagement and its implications in practice. As active learning usually requires students to express their thoughts and collaboratively find answers, verbal participation is considered a good indicator of engagement. Lack of verbal participation, or silence, can be considered as a sign of low student engagement (12).

### **Self-Regulated Learning**

Self-regulation refers to the process through which active learners independently convert their mental abilities into academic capabilities. It includes self-generated ideas, emotions, and actions that are focused on achieving the objectives of the learning process. Self-regulation is essential because one of education main goals is to prepare students for a lifetime of learning. It involves more than detailed knowledge or skills as it includes the self-awareness, self-motivation, and behavioural skill to properly implement that knowledge. Multiple skills are attained by self-regulated learners including setting specific proximal, adopting powerful strategies for attaining the goals, monitoring performance, restructuring learner's physical and social context to make it compatible with their goals, efficient time management, self-evaluating learning methods, and adapting appropriate future plans. Teaching students to become self-regulated learners and use self-regulatory processes, such as goal setting and self-monitoring, are generally important to change the perspective of the learners to become active rather than passive learners. Research shows that self-regulatory processes are teachable and can increase students' motivation. Self-regulated learners concentrate on how they initiate, modify, and maintain particular learning habits in both group settings and individual activities. Adopting self-regulated learning processes that will eventually enhance active learning is especially important at both individual and institutional levels particularly at a time when the crucial traits for lifelong learning are considered (13).

#### **A. Institutional strategies:**

##### **1. Problem-based learning (PBL):**

Problem-based learning is one of the active learning strategies that places a focus on the needs of individual students. PBL students discuss in small

groups problems or learning difficulties that are relevant to their practice (14).

PBL's main objective is to help students develop their clinical reasoning and problem-solving abilities. A series of issues is used in PBL programs to get students involved in studying in small groups. The key elements of the problems are then identified, together with the knowledge gaps that prevent them from fully understanding these problems and the best course of action for dealing with it. The potential of prior knowledge is acknowledged by PBL, the learner is able to pinpoint their own learning needs because more knowledge is only learned when it is "need to know"-based (15).

The theory behind problem-based learning contends that for knowledge acquisition to be effective, learners must be encouraged to reorganize information they already know within a specific context, acquire new knowledge, and then elaborate on the new knowledge. PBL places more focus on a person's capacity to seek out and integrate pertinent knowledge to address a problem at hand, setting it apart from more "traditional" approaches to teaching in that it encourages participants to apply self-directed learning skills. The participants evaluate a particular clinical scenario, create and organize the scenario's major learning goals, and then gather any extra data they see necessary to effectively manage the problems in the scenario. Importantly, all of this occurs in a group context so that every group member can contribute to learning at all stages (16, 17).

Recent studies have revealed that students who received their education in the setting of a PBL curriculum demonstrated better diagnostic performance than those who received their education in a traditional curriculum. Bringing together basic and clinical sciences was thought to have this effect. Additionally, compared to non-PBL students, PBL students were better able to explain difficulties coherently and were more likely to include scientific principles in their justifications. PBL's small group format is extremely beneficial for the development of collaborative, communication, and teamwork skills. When it comes to higher order activities in active learning like analysis, assessment, and synthesis, small-group work is preferable to a lecture. This might signify better motivation in small groups. (15, 16).

Several key questions must be addressed before PBL is implemented by a medical program: what are the educational objectives, what makes PBL so unique, what are the best ways to integrate PBL into the curriculum, how to get a faculty ready for PBL, what issues ought to be addressed, and how to be organized and presented (17).

The design of the PBL process (i.e., a pre-discussion of the problem to activate prior knowledge and formulate learning issues, an individual self-study



time period, and a reporting phase in which various literature findings are discussed and integrated) is aligned with the principles of active learning. Students gain problem-solving abilities at the same time as they gain content knowledge during the reporting phase by learning how to comprehend the underlying mechanics of the current challenge. In other words, PBL is thought to promote a deep approach to learning since students examine connections between concepts and principles, integrate many literary resources, apply these concepts and principles to the problems that are discussed in the group, and integrate knowledge and skills (14).

The curriculum in PBL context is organized into thematic blocks, with each block focusing on a different theme. The students will work on a number of scenarios/problems throughout each period. The "Seven Jump" approach (16) was created to assist students in problem analysis: concepts must be made clear, problems must be defined, problems must be analyzed, answers must be found, learning objectives must be developed, information must be sought after, and finally new information must be reported and tested. Self-guided study groups examine and discuss the cases together (16).

The ideal class size is seven or eight students. The size must not be less than five or greater than ten. To avoid more than the coincidental number of groups with very high or low performance due to prior selection, students should preferably be randomly assigned to their groups. One major point is to establish a continuous evaluation process by introducing feedback round at the end of each PBL-session. A typical session consists of a group of students plus a tutor who facilitates the session to make up a typical PBL tutorial. The role of the "teacher" is primarily to facilitate the learning process and she or he should avoid acting as an expert. The tutor's function is changed to that of a facilitator who creates a stimulating environment for the students' activities. The time duration and number of sessions a group spends together may vary, but the time allocated should allow for the development of appropriate group dynamics. For each PBL session, students may choose a leader, timekeeper, and/or secretary or script (17).

## 2. Community-based education (CBE):

Community-Based Education can be defined as an active learning strategy that involves students in crucial services to their institutions and surrounding community to improve student learning (18). Another definition describes CBE as an experiential learning strategy that combines classroom instructions with volunteer work to provide students with the chance to think of, engage in, and learn from their local community. Due to varying institutional visions, traditions, aims, and missions, educational institutions may participate in community-based learning in a variety of ways. Regardless of how educational institutions incorporate community-based learning, CBE

must be experimental and linked to programs, course learning objectives, teaching and learning processes, and provides structured opportunities for active learning within the community. Using traditional teaching methods makes it harder for students to put the concept into reality and learn from their mistakes (18).

CBE provides a real-world experience that, when combined with a critical analysis of how the service relates to important course concepts, can foster theoretical development and learning among students in various institutions of learning (19).

Establishing a Health Professions' Education (HPE) institute is fundamentally intended to accomplish three objectives: educate healthcare professionals, develop knowledge via research, and offer care to the patients and communities they serve. Community-Based Education and Problem-Based Learning are two apparently similar innovations that support these objectives. CBE must include activities that heavily involve the community and take place in a variety of settings, mainly primary and secondary health care facilities, where teachers, community members, and representatives of other sectors are actively involved throughout the educational process in addition to students. The overall aim of CBE is to train undergraduate health professional students in the diagnosis, management, and, if possible, solution of community health problems (20).

Students may acquire competencies through CBE that they would never acquire otherwise, including leadership abilities, teamwork skills, and the capacity to engage with the community. There are three main types of CBE programs: service-oriented, research-oriented and training-focused, all these types aim at providing students with opportunities that enhance active learning through and within the community (21).

## 3. Team-based Learning (TBL):

TBL is defined as a learner-centered, teacher-directed educational strategy that encourages active learning and advanced cognitive abilities, both student problem-solving and teamwork are required in the TBL learning environment. These characteristics make TBL a suitable solution for additional higher education sectors. Since both approaches are frequently utilized in medical education and are sometimes mistaken, it is important to clarify the differences between TBL and (PBL): learning about issues that are relevant to your career and learning in small groups or teams are the two aspects of PBL and TBL that are similar. There are numerous ways to define team-based learning (TBL). In its simplest form, it is a model for teaching that encourages active learning and places single teachers in charge of numerous small teams. TBL consists of phases and learning activities (22). The learning theories of constructivism and social constructivism make the foundation of team-based learning. The fundamental tenet of constructivism theory is that the learner chooses how and when to



reconstruct knowledge depending on what they have already acquired. Prior knowledge is crucial to learning, thus the teacher should design tasks and group activities that will encourage students to use their prior knowledge and give it priority. Because TBL initiatives in medical education may range from a single session to a complete course, describing the general context and extent of the implementation is crucial because these variations influence design choices related to the core elements. TBL is a teacher-directed approach for including several small groups in a single classroom setting, often with a single instructor and five to seven students per group (e.g., undergraduate sessions, graduate conferences, continuing education activities), (23).

TBL consists of three essential elements including: 1) Carefully assembling and leading teams, and it is highly recommended to guarantee that each team contains a varied set of students, so students should be assigned to teams in a transparent manner, 2) Students should receive timely and frequent feedback throughout the entire process, with facilitators providing clarity, 3) Problem-solving in which teams are required to employ their prior knowledge, clinical reasoning, ethical perspectives, abilities, and values to solve complicated clinical problems that relate to real-world scenarios during the clinical problem-solving exercises (24).

**Three phases** are used to explain the steps in TBL process:

Phase one: in which the trainers choose the training's goals, objectives, and content. They also define the learning results. Students make use of the suggested resources to learn more about the predetermined and well-informed learning objectives. The fundamental criterion is that students should be prepared for class. Students are given readings and other assignments that are connected to the topic a week before it is scheduled, and they are expected to learn from this information. The reference information shouldn't be more than five pages long and should be understandable to students.

Phase two: Students should come to the following class time prepared to perform an individual readiness assurance test (iRAT) on the given content. At the start of class, each student is assessed individually, and after 15 minutes, the papers are collected. Between eight and ten items, all of which should be addressed by multiple-choice questions, and included in the iRAT questionnaire. Students are required to retake the individual test in groups after turning in their answers for team readiness assurance test (tRAT). The teacher is supposed to give the teams oral feedback following the tRAT. Each team is asked to indicate their response before the lecturer goes over the questions one at a time.

Phase three: in which the lecturer gives each group a task or case study and asks them to find a solution. Each group should receive the same

assignment. Teams are tasked with rating the performance of their teammates during the activities at the conclusion of the session. Members of the team must work together while learning. Teams frequently encounter optimal intergroup interactions applying the fundamental ideas they learn, solving complex issues, and clearly communicating their conclusions. Peer assessment/evaluation is also essential in this phase (22, 23).

TBL also has the following characteristics that make it different and especially appropriate for health professions education: a. flexibility in use "groups might be big or small, include one or more sessions, be all or part of a course, mix lectures, labs, and other learning activities, and participate in inter-professional education activities, b. forming a team effectively "Teams are intentionally and openly formed, and in an ideal world, teams remain together for as long as feasible, and c. preparation outside of class "so students are actively engaged throughout the learning process (25).

#### 4. Case-based Learning (CBL):

CBL is an inquiry-based active learning method that has been utilized in the medical fields at least since 1912. CBL aims to prepare students for clinical practice. By employing inquiry-based learning techniques to apply knowledge to the examples, it connects theory to practice. Using open-ended questions with clear objectives, trainees clinically investigate pertinent subjects during case-based learning. To better define CBL, PBL is compared and contrasted with it. A clinical case serves as the focal point of PBL. When learning sessions begin, the goals are frequently not as clearly stated, and learning takes place while the student works to solve the problem. There is an instructor, but he or she offers guidance in a less intrusive manner than in CBL, in contrast to PBL, which places the emphasis on the student as the driver, CBL places a greater emphasis on the teachers as the learning's guides and directors (26, 27).

Faculty engage with students more actively during CBL sessions to give feedback, respond to inquiries, facilitate discussion, and oversee progress. Facilitators utilize guiding questions to bring learners back to the expected learning objectives when they go off on tangents. Students are encouraged to raise questions throughout the session, and facilitators take an active role in addressing learners' misconceptions. With CBL, the facilitator wraps up the session by providing students with the "best possible" or right answers. In most cases, CBL is taught in a single working session, and no additional homework or group presentations are given to the students. Like PBL, there is a substantial amount of literature describing the usage and efficacy of CBL (28).

The most common way to deliver cases was through small or large group discussions, usually with a facilitator; other methods included using computer-based cases online, video presentations, whole classes, and discussions after online cases, having students review



cases ahead of time so they can discuss them in groups, and facilitating discussions with trigger questions. Less common techniques included having students write cases and discuss them with younger students; using cases to discuss the obligations and functions of different professions is also highlighted (27, 28).

## **B. Individual Strategies (At the instructor level):**

### **1. Interactive lecturing (large group teaching):**

There are numerous ways to understand interactive lectures. Some individuals believe that interactive lecturing entails two-way communication between the presenter and the audience. Others interpret it as more conversation among participants. It is not necessary for the audience to speak exclusively; interaction can also relate to a student's engagement with the subject matter or lecture content. However, interactive lecturing entails audience engagement so that students are no longer passive in the learning process. Additionally, interactive lectures provide an alternative method of addressing the teacher's job. When delivering this kind of presentation, the "teacher" frequently transforms into a "facilitator" or "coach" and must alter the lecture's subject matter to accommodate discussion and try new things. There is growing opposition to lectures as a teaching and information-delivery tool. The finding that lectures are less effective than other approaches when educational objectives require the application of knowledge or facts, the development of thinking abilities, or the adjustment of attitudes is one of the main grounds for this criticism (29, 30).

**Commonly used interactive techniques during large group teaching:** The aim of all these various techniques is to increase student engagement, focus, and motivation during the learning process, even though their indicators and restrictions may vary. These techniques consist of the following: **a.** dividing the class into more manageable smaller groups to foster understanding, application, and problem-solving. Therefore, including small groups in lectures can help to encourage debate of ideas and concepts, examine problems, and provide solutions, encourage the application of new ideas, and improve problem-solving and communication skills, **b.** Questioning the audience: Questions can be used to raise interest, draw attention, and offer both the teacher and the student useful feedback. It is crucial to keep in mind to use non-threatening questions to the audience, wait for a response, and make sure that more than one student has the chance to react, **c.** Surveying the class: This strategy is particularly helpful for determining audience requirements and interests, for enabling teachers to gauge the students' baseline knowledge level on a specific topics, and for boosting motivation, **d.** Quizzes and short answers: that are utilized to provide a "check-up" on learning, summarize or synthesize the material covered, and identify areas in which both the teacher and the students need more explanation, **e.** Using clinical cases: Case presentations can be structured in a variety of ways. A brief case study, for

instance, can be utilized at any point in the lecture to support a particular theory or to explain certain points, **f.** Utilizing written materials can help organize important ideas, encourage memory retention, and relieve instructor pressure to "cover everything." e.g., slide handouts, **g.** Organizing debates: Debates can be held in a variety of ways. For instance, the class might be split in half (perhaps along the two walls of the lecture hall), and the students on either side might be asked to support two opposing viewpoints. The students' "sides" may be assigned in advance, or they may be asked to choose their own seats in accordance with their opinions, **h.** Using simulations and role plays: Simulations can increase interest and clinical relevance in the lecture format by giving students a situation that they are likely to encounter in the future (29, 30, 31).

### **2. Small Group Teaching:**

Whether it takes place in a university "classroom," a hospital, or a community "clinical setting," a well-planned small group teaching session offers a systematic approach for both teachers and learners. Effective small group teaching and learning practices boost active learning, student engagement, information retention, self-directed learning, communication skills, teamwork ability, and peer discussion as compared to didactic lectures. The interactive and social nature of small group instruction and the students' active participation throughout the whole learning cycle are its defining features. Since this involves exchanges between students, their peers, and facilitators rather than a one-way engagement in which knowledge is transferred from the teacher to the student, it is known as "collaborative learning" (32).

Questioning, listening, answering, and explaining are the four main conversation abilities in small group learning. These abilities serve as the building blocks for the growth of teamwork and collaborative learning. Both the tutor's and the students' preparation, as well as the tutor's opening and closing, are crucial. The ability to determine when to apply a conversation skill is the tutor's most crucial meta-skill. A tutor should act as a leader, facilitator, commentator, "drop-in wanderer," counsellor, and absent friend in addition to being a neutral chair. The roles and obligations of the tutor and students should be clarified, agreed upon, and addressed before the beginning of a course, and the students should be periodically reminded of their tasks and responsibilities as well as those of their tutors (33).

### **3. Flipped classroom (FC):**

FC is the outcome of employing face-to-face or online time for more active learning techniques like reflection, group projects, or discussions while giving students didactic information to read before class. The allotted pre-class material, formative evaluation, addressing learning gaps, competency development, and the teachers' support role as a guide on the side are essential components of an FC. The steps for



implementing a flipped classroom are generally as follows: 1) plan your learning activities using a backward instructional design, 2) provide opportunities for pre-learning (such as brief recordings of didactic materials), 3) create formative and diagnostic assessments to identify learning gaps, and 4) use active learning strategies and technology to close the gaps in learning and build competency (34).

The major goal of FC is to give students more time to acquire new material by allowing them to investigate the lecture topic to push their knowledge-smearing skills and interact with one another in practical ways. This makes it easier for students to engage in learning new information or abilities, and they are far more likely to monitor their own development and ultimately develop confidence as a result (35).

The learning process in FC is divided into three stages: before class, during class, and after class. In "Pre-Class" stage the students initially gain knowledge of new ideas through pre-reading assignments and other online learning tools like lectures or videos. They discuss and solidify the newly learned concepts with their peers and the instructors during "In-Class" stage. This gives them the opportunity to learn more by engaging in discussions with their tutors and working on a group project with other students. Reflecting on their learning while in "After-Class" stage helps students retain and apply what they have learned. For higher order cognition, such as concentrated learning and presentation of knowledge through problem-solving, case-based situations, and imitation with assistance from peers, valuable face-to-face time with the tutor is marked (36, 37).

### Conclusion:

In conclusion, implementing effective strategies to enhance active learning among medical students is crucial for fostering a deeper understanding of complex medical concepts, promoting critical thinking skills, and preparing future healthcare professionals for the dynamic challenges of their field. The multifaceted nature of active learning, encompassing approaches such as problem-based learning, case-based discussions, and collaborative activities, contributes to a more engaging and participatory educational experience. By incorporating technology, encouraging peer-to-peer interaction, and providing real-world clinical scenarios, educators can create a dynamic learning environment that mirrors the challenges students will face in their medical careers.

Furthermore, ongoing faculty development programs and institutional support are essential to overcoming resistance to change and ensuring the successful integration of active learning methods. Faculty members equipped with the necessary skills and resources can better facilitate interactive sessions, tailor activities to the diverse learning styles of medical students, and address potential challenges associated with the implementation of active learning. Additionally, fostering a culture that values continuous improvement,

feedback, and reflection will contribute to the sustained success of active learning initiatives in medical education. Ultimately, as medical education continues to evolve, the integration of innovative and evidence-based active learning strategies will play a pivotal role in shaping the next generation of competent and compassionate healthcare professionals.

### Competing interests:

The authors have no relevant financial or non-financial interests to disclose. The authors have no competing interests to declare that are relevant to the content of this article. All authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

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