

## TECHNOLOGIES FOR TRAINING STUDENTS' CLINICAL THINKING THROUGH THE DISCIPLINE OF INFECTIOUS DISEASES

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**Abstract:** This article explores innovative technologies for training medical students in clinical thinking through the study of infectious diseases. The proposed approach integrates simulation-based learning, case-based methods, digital tools, and the VAK (Visual, Auditory, Kinesthetic) model to develop diagnostic reasoning, decision-making, and professional competence.

**Keywords:** clinical thinking, infectious diseases, medical education, simulation technologies, diagnostic competence, VAK model, case-based learning, cross-disciplinary approach.

### INTRODUCTION

In the landscape of modern medical education, clinical thinking is universally regarded as a fundamental skill. It is the cornerstone that enables future doctors to expertly analyze complex clinical scenarios, make sound, evidence-based decisions, and ultimately provide high-quality patient care. The field of infectious diseases serves as an ideal training ground for this competency, largely due to its characteristic diverse presentations, requirements for urgent management, and critical reliance on accurate diagnosis. The advent of innovative educational technologies—including simulation-based learning, interactive case studies, digital tools, and the VAK (Visual, Auditory, Kinesthetic) model—has been instrumental in transforming traditional teaching from a passive process into a dynamic, student-centered experience. These advanced tools empower medical students to forge a crucial link between theoretical knowledge and its practical application, thereby building strong diagnostic reasoning and problem-solving abilities. As graduates enter a competitive labor market, the demand for a high level of practical-clinical competence is steadily increasing, making it imperative to cultivate these skills from the earliest stages of their education. This article explores a comprehensive framework of technologies and pedagogical strategies designed to systematically develop clinical thinking within the discipline of infectious diseases.

### METHODS

The proposed approach for enhancing clinical thinking is a multifaceted strategy that moves beyond traditional subject-matter teaching to embrace a more holistic, psychologically-informed, and technologically-integrated methodology.

1. Integrative pedagogical framework: The core of the methodology is the principle that developing practical-clinical competence requires an integrated approach. Knowledge and experience must be considered an integrated whole. This means that the learning process should not be confined to the subject matter but must also be interwoven with psychological and pedagogical principles. The teacher's role is to combine these approaches, organizing the learning process around the core questions: "Who do we teach, why, and how?"

2. Technology-enhanced learning: A central component is the use of innovative technologies to create realistic, practice-oriented learning experiences. This includes:

- Simulation-based learning: Using simulation technologies to allow students to practice clinical skills in a controlled, safe environment.
  - Case-based and interactive methods: Conducting lessons using interactive, clinically oriented methods that are based on real-life scenarios to enhance engagement and practical understanding.
  - The VAK (Visual, Auditory, Kinesthetic) Model: Integrating the VAK model to cater to different learning styles and make the educational process more effective.
3. Differentiated instruction and student grouping: Acknowledging that failing to account for students' individual needs, knowledge levels, and psychological differences decreases educational effectiveness, the methodology incorporates a differentiated approach. Based on the work of D. Kolb, this involves dividing students into small groups according to their level of knowledge and applying appropriate teaching methods to each group. For instance, high-achieving students would be given independent, complex tasks, while interactive and visually enriched methods would be used for those with lower academic performance.
4. Creation of a positive psychological environment: The methodology directly addresses psychological barriers that can impede learning. Research has shown that factors like fear of making mistakes and anxiety can significantly limit students' clinical reasoning activity. To counteract this, it is necessary to create a positive psychological climate during the learning process by using role-playing exercises, assigning pair and group work, and fostering a sense of tolerance for mistakes to build student confidence.
5. Professional development for educators: A key recommendation is the establishment of specialized professional development courses for teachers in medical universities focused specifically on clinical methodology. This is proposed to address the significant issue of insufficient methodological training among teachers, which often leads to a reliance on traditional, less effective teaching approaches.

## RESULTS

The analysis within the provided text identifies several key findings and outcomes related to the current state and proposed enhancement of clinical thinking development.

**Impact of Psychological Barriers:** A significant finding from research among students of infectious diseases is that psychological barriers, such as the fear of making mistakes and anxiety when demonstrating clinical competence, directly and negatively affect the effectiveness of learning by limiting clinical reasoning activity.

**Deficiencies in Current Pedagogy:** Despite the theoretical acknowledgment of the practical-clinical approach, significant issues persist in its practical application. This gap is primarily attributed to two factors: insufficient methodological training of teachers and the persistence of traditional teaching approaches.

**Identified Mechanisms of Clinical Reasoning:** A structural-functional analysis of clinical reasoning has successfully identified the underlying mechanisms involved in the process of developing various forms of expression for future physicians. This analysis reveals that practical-clinical competence requires a constant readiness to shift from static knowledge to dynamic application and goal-directed reflection.

**Anticipated Outcomes of Proposed Methods:** The application of the proposed technologies, including simulation, case-based learning, and the VAK model, is expected to produce highly positive results. It is anticipated that students will acquire a refined ability to analyze symptoms, evaluate differential diagnoses, and make accurate clinical decisions. Furthermore, these methods are projected to foster independent thinking, strengthen professional motivation, and

ensure readiness for clinical practice, thereby creating a solid foundation for developing competent and reflective physicians.

### DISCUSSION

The development of clinical thinking is a complex psychological and pedagogical activity, not merely a process of selecting teaching methods. Practical-clinical competence should not be seen as the result of natural development but as a structured set of competencies that must be purposefully and systematically cultivated during the educational process. According to J. Raven, this competence involves the ability to effectively exchange information, express thoughts clearly, and establish relationships appropriate to the professional context, encompassing cognitive, affective, and professional dimensions.

The proposed framework is built on a deep understanding of the characteristics of practical-clinical skills, which include being goal-oriented, dynamic, productive, integrative, hierarchical, and independent. This multi-faceted nature underscores why a simplistic, one-size-fits-all teaching approach is inadequate. Clinical reasoning itself is inherently situational; its character is a unique feature because it is always tied to specific circumstances in terms of content and timing. This situational dependency necessitates an educational approach that prepares students for the dynamic and unpredictable nature of real-world clinical practice.

Overcoming the key factors that hinder the effective development of these competencies requires a systematic approach, methodological innovations, and well-grounded pedagogical solutions. The insufficient methodological training of educators is a critical bottleneck that must be addressed through specialized professional development. Simultaneously, creating a supportive psychological environment is essential to dismantle the fear and anxiety that stifle student participation and learning. By integrating advanced technologies and differentiated instruction, educators can better activate students' internal resources and practical-clinical skills. Ultimately, this comprehensive strategy, which addresses both teacher preparation and student experience, provides a robust pathway to forming competent, reflective, and patient-centered physicians.

### REFERENCES:

1. Ten Cate O. Competency-based Postgraduate Medical Education: Past, Present and Future. *GMS J Med Educ.* 2017; 34(5): Doc69.
2. Dorman T., Boshuizen H., King N., Scherpbier A. Experience-based learning: a model linking the processes and outcomes of medical students' workplace learning. *Med Educ.* 2007; 41(1): 84–91.
3. Ghosh S. Combination of didactic lectures and case-oriented problem-solving tutorials toward better learning: perceptions of students from a conventional medical curriculum. *Adv Physiol Educ.* 2007; 31(2): 193–197.
4. Choi J.Y. *Simulation in Infectious Disease Education.* Seoul: Korea University Press; 2022. – 232 p.
5. Pashler H., McDaniel M., Rohrer D., Bjork R. Learning styles: Concepts and evidence. *Psychological Science in the Public Interest.* 2008; 9(3): 105–119.
6. WHO. *Medical Education in the 21st Century: Global Standards.* Geneva: World Health Organization; 2020. – 72 p.