SPECIFIC ASPECTS OF DEVELOPING MULTIDISCIPLINARY COMPETENCIES IN MEDICAL STUDENTS BASED ON THE DEAR (DESCRIBE, EXPLAIN, ANALYZE, REFLECT) MODEL.

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Abstract: *This article explores the use of the DEAR model (Describe, Explain, Analyze, Reflect) as a pedagogical framework for developing multidisciplinary competencies in medical students. It outlines how each phase of the model contributes to integrating knowledge from various biomedical disciplines, enhancing critical thinking, and fostering reflective clinical reasoning.*

Keywords: *DEAR model, multidisciplinary competence, reflective learning, medical education, clinical reasoning, integrative teaching, critical thinking, microbiology, immunology, student autonomy.*

In the 21st-century medical education landscape, future physicians are expected not only to master isolated biomedical facts but also to synthesize knowledge across disciplines, apply it in clinical settings, and reflect on their actions and outcomes. This calls for multidisciplinary competence, defined as the ability to draw from various scientific domains—such as microbiology, pathology, immunology, and pharmacology—to make sound clinical decisions.

Traditional teaching models often emphasize memorization over understanding, and they fail to encourage integration across subject areas. To address this gap, educational strategies that combine reflective practice, critical analysis, and problem-solving have gained prominence. One such approach is the DEAR model—a structured method consisting of four progressive stages:

- Describe: clearly identify the problem or situation,
- Explain: explore underlying mechanisms or concepts,
- Analyze: critically evaluate data or relationships,
- Reflect: assess implications, actions, or learning outcomes.

Originally rooted in adult learning theory and reflective pedagogy, the DEAR model serves as a powerful tool in medical education for helping students process complex clinical or scientific scenarios. This article focuses on how the DEAR framework can be methodically applied to cultivate multidisciplinary competence, particularly in the context of teaching microbiology, immunology, and internal medicine.

Modern medical education increasingly integrates digital technologies to bridge the gap between theoretical instruction and clinical application. Among these technologies, virtual laboratories play a pivotal role in providing immersive, interactive, and repeatable learning environments. This is particularly valuable for teaching complex, abstract subjects such as microbiology, virology, and immunology, where traditional teaching tools may fall short in visualizing microscopic and molecular-level processes.

Labster and Visible Body Microbiology are two leading platforms that address this need by offering realistic simulations and 3D models to visualize cellular and pathogen-related mechanisms.

Labster.

- Labster provides fully interactive 3D lab simulations designed to teach students laboratory techniques and theoretical concepts in a virtual environment.
- In microbiology and virology, simulations include:
  - Gram staining procedure
  - Bacterial culture and identification
  - Antibiotic resistance testing (e.g., Kirby-Bauer)
  - ELISA tests for immunological diagnosis
- Labster incorporates gamification, allowing students to engage with a mission-driven storyline, make decisions, and receive feedback throughout the experiment.

Visible Body Microbiology.

- This platform focuses on detailed 3D anatomical and molecular visualizations, particularly useful for understanding:
  - Viral morphology and replication cycles.
  - Immune response pathways (e.g., T-cell activation, antibody-antigen interactions)
  - Host-pathogen interactions.
- Models are interactive—students can rotate, isolate, and label structures, making it easier to comprehend the structure-function relationships of pathogens and immune cells.

The integration of these platforms into microbiology, virology, and immunology teaching follows a blended learning model:

A. Pre-class Activities.

- Students complete Labster simulations or Visible Body modules as pre-lab assignments.
- These simulations introduce experimental techniques and theoretical background, reducing cognitive load before physical lab sessions or lectures.

B. In-class Engagement.

- Faculty use selected simulations as the basis for case-based discussions.
- For example:
  - After completing a Labster ELISA simulation, students analyze a clinical case involving hepatitis or HIV diagnosis.
  - Using Visible Body, students examine the structural differences between RNA and DNA viruses, linking morphology to replication behavior.

C. Post-class Reflection.

- Students engage in structured reflection using models such as DEAR (Describe, Explain, Analyze, Reflect):
  - Describe the simulation process,
  - Explain the science behind each step,
  - Analyze potential experimental outcomes or errors,

- Reflect on how this applies to clinical diagnosis or treatment.

D. Assessment.

- Performance is assessed through quizzes, simulation reports, and reflective writing assignments.
- In some programs, virtual lab activities are graded components of practical coursework.

The DEAR model provides a structured and effective approach for fostering multidisciplinary competencies in medical students. By guiding learners through a cycle of description, explanation, analysis, and reflection, educators can encourage deeper engagement, cross-disciplinary integration, and clinical reasoning skills that are essential for modern healthcare practice.

Implementing the DEAR model in subjects such as microbiology, immunology, and internal medicine allows students to see connections between theory and practice, strengthens their ability to approach problems from multiple perspectives, and enhances their capacity for lifelong learning. Furthermore, it promotes autonomy and metacognition, empowering students to take ownership of their educational journey.

For maximum impact, the DEAR framework should be incorporated into case-based discussions, simulation activities, lab reflections, and clinical debriefings. As an evidence-based model rooted in reflective learning theory, DEAR holds significant promise for transforming how multidisciplinary competencies are developed in medical education.

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