http://www.moderntechno.de/index.php/meit/article/view/meit41-03-043
DOI: 10.30890/2567-5273.2025-41-03-043

UDC: 378.147: 57.08

DIFFERENTIATED APPROACH TO TEACHING MEDICAL BIOLOGY AS A WAY TO FORM PROFESSIONAL COMPETENCE OF DENTISTRY AND PHYSICAL THERAPY STUDENTS: THEORETICAL AND METHODOLOGICAL ANALYSIS

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Abstract. *The article theoretically substantiates and designs a methodology for implementing a differentiated approach to teaching the "Medical Biology" course to students of the educational programs "Dentistry" and "Physical Therapy". The paper addresses the problem of insufficient professional orientation within unified curricula.*

The study's primary objective is the theoretical substantiation and design of a differentiated teaching model. Professional profiles were analyzed to determine the direction for content intensification: genetics and embryonic development (maxillofacial pathology focus) for Dentistry students, and genetics of hereditary diseases (musculoskeletal focus) and cellular regeneration mechanisms for Physical Therapy students. A conceptual model of the professionally oriented case method is proposed as the primary instrument for differentiation.

The design analysis suggests that the implemented model will effectively ensure professional knowledge integration. The expected outcomes (target indicators) include enhanced academic achievement and the formation of conscious professional competence, which is theorized to be confirmed by a high positive correlation between achievement levels and students' internal motivation.

The differentiated approach model is theoretically sound and methodologically justified. Its implementation is crucial for adapting Medical Biology to modern higher education requirements by successfully integrating fundamental knowledge with the specific clinical needs of future dentists and physical therapists.

Keywords: *Medical Biology, Differentiated Instruction, Professional Orientation, Curriculum Design, Dentistry, Physical Therapy, Hereditary Diseases, Integration, Embryogenesis, Regeneration.*

Introduction.

Modern medical education is oriented towards a competence-based approach [2], requiring specialists to be capable of integrating fundamental knowledge into clinical practice [1]. Medical Biology, as a basic discipline, forms the foundation of this process, laying the groundwork for understanding the genetic, cellular, and molecular mechanisms of health and pathology. However, unified curricula for specialties with differing clinical priorities, such as "Dentistry" and "Physical Therapy," lead to insufficient professional orientation in training [5].

There is a clear disparity between general biological knowledge and the narrow specialized needs of practitioners [4]. The necessity of studying genetically determined musculoskeletal defects for physical therapists and achieving a deep understanding of facial embryogenesis for dentists justifies the need to design a new, differentiated teaching model [3]. The main focus of this article is the theoretical substantiation and development of such a model.

Main Text.

The aim of the study is the theoretical substantiation and development of the conceptual foundations of a differentiated approach to teaching Medical Biology to students of the specialties "Dentistry" and "Physical Therapy."

The main text further elaborates on the study's aim and outlines the following specific objectives:

1. To conduct an analysis of the academic content and determine the directions for the intensification of fundamental sections of medical biology according to the professional profiles of the "Dentistry" and "Physical Therapy" specialties.

2. To develop a conceptual model of the professionally oriented case method based on the intensified aspects of the fundamental content of the course, adapted to the clinical needs of each specialty.

3. To formulate target indicators and evaluation criteria (qualitative and quantitative) for the effectiveness of implementing the designed methodological model into the educational process.

Given the project-based nature of this work, its theoretical substantiation was

based on a systematic approach [6] and the principles of professional orientation in higher education pedagogy. The theoretical methods used included: analysis of the curricula of the Ministry of Education and Science/Ministry of Health, comparison of the professional profiles of the specialties, and the modeling of a new differentiated methodology [7].

Based on these foundations, the concept of content differentiation was formulated. It involves not only the selection but also the intensified focusing on specific fundamental sections of the content modules that are critically important for forming specific professional competencies [8]. The detailed directions for intensifying the content of the "Medical Biology" course for the "Dentistry" and "Physical Therapy" specialties are presented in Table 1.

Table 1. Model of Content Differentiation for the "Medical Biology" Course

Specialty	***Direction for Intensifying Fundamental Sections***	***Expected Professional Focus***
Dentistry	*Genetics and Embryonic Development, Parasitology*: In-depth study of the mechanisms of maxillofacial development, hereditary anomalies, and parasitic infections.	Diagnosis of congenital defects as the basis for substantiating orthodontic and surgical interventions.
Physical Therapy	*General and Medical Genetics, Cytology, Molecular Biology*: In-depth study of the genetics of hereditary syndromes (with musculoskeletal defects), as well as the mechanisms of regeneration and tissue repair.	Formation of the biological basis for understanding the pathogenesis of motor disorders; scientific substantiation of tissue repair principles and the effectiveness of physiotherapeutic interventions.

For the implementation of the designed content differentiation and to ensure effective professional knowledge integration, the professionally oriented case method [9] is proposed. This method is the main didactic tool based on the intensified aspects of the fundamental course content. It allows complex biological material to be linked to specific clinical scenarios, thereby ensuring the necessary knowledge transfer and converting it into a professionally relevant tool [10].

We have prepared examples of the case method for Dentistry students and students pursuing the profession of Physical Therapist.

Case Example for Dentists (Genetics/Embryogenesis): the student is asked to analyze the pedigree of a patient with a cleft lip and palate. The task is to determine the type of inheritance and explain this defect from the perspective of disturbed fusion of embryonic rudiments (elements of maxillofacial embryogenesis).

Case Example for Physical Therapists (Genetics/Regeneration): the student is asked to biologically explain the mechanism of progressive muscle weakness in a patient with Duchenne muscular dystrophy. The task is to determine the molecular role of the defective dystrophin protein and justify how the absence of this protein leads to muscle cell destruction (mechanisms of cellular destruction and regeneration insufficiency).

These examples demonstrate the mechanism of integrating fundamental content (Genetics, Embryogenesis, Regeneration) into professionally relevant scenarios. Thus, the complete implementation of the Content Differentiation Concept requires the systematic design of similar professionally oriented cases for all thematic sections of the course identified as priorities for each specialty.

This section presents a detailed description of the designed methodological model and the expected target indicators of its implementation.

The formulated target indicators for the project's effectiveness, which will be verified at the stage of the empirical experiment, include: the expected increase in academic achievement and the formation of a high direct correlation between knowledge acquisition and the student's internal motivation. This correlation is considered a primary indicator of forming conscious professional competence.

Conclusions.

It is theoretically substantiated that to ensure high-quality higher medical education and the formation of conscious professional competence, a transition from a unified teaching of Medical Biology to a differentiated approach is necessary for the specialties "Dentistry" and "Physical Therapy".

A conceptual model of differentiation has been developed, which is based on the intensification of professionally relevant aspects of the fundamental content. This involves focusing on genetics and embryogenesis (with a focus on the maxillofacial region) for dentists, as well as the genetics of hereditary diseases (with musculoskeletal defects) and mechanisms of regeneration for physical therapists.

It is determined that the main instrument for implementing content differentiation is the professionally oriented case method. Its implementation should ensure the necessary knowledge transfer from fundamental theory to specific clinical scenarios.

Target indicators for the project's effectiveness are formulated, which include the expected increase in academic achievement and the formation of a high direct correlation between knowledge acquisition and the student's internal motivation.

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