

**MODERN APPROACHES TO OPTIMIZATION OF
EDUCATIONAL PROCESS IN THE MEDICAL BIOLOGY,
PHARMACOGNOSY AND BOTANY DEPARTMENT OF
THE STATE INSTITUTION “DNIPROPETROVSK MEDICAL
ACADEMY OF HEALTH MINISTRY OF UKRAINE”**

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Annotation. *The article shows methodical methods and organizational forms of the educational process, which are used in the educational and scientific process during the teaching of disciplines to students of such specialties as “Pharmacy” and “Medicine”. The article describes the research activities of students, which makes it possible to identify creative abilities and readiness for self-realization; independent work, which is an essential part of the educational process; participation in the training and field practice, which forms general cultural and professional competences in the specialist’s professional activities, case study, which actualizes students a certain set of knowledge acquired from other academic disciplines, helps to overcome stereotypes of thinking.*

Key words: *medical education, pharmacy, educational process, teaching practice, teaching methods, case study.*

Changes and transformations, taking place in the conditions of society renewal, put forward new requirements to the content of higher medical and pharmaceutical education in Ukraine, to the quality of professional training of future doctors and pharmacists, require the integration of higher education to the world system while preserving and developing the achievements and traditions of the Ukrainian higher school. One of the tendencies of modernization and development of modern education is transition of educational institutions from the educational process to the scientific one, which allows to organize the research work of students of the higher professional education system in various forms of its manifestation: student scientific societies, elective courses, scientific and practical conferences, solving problem situations during practice and so on. This, in turn, necessitates the development of theoretical and methodological foundations for the formation of an independent, initiative, creatively organized personality which can quickly and flexibly adapt to changes during professional activities, and is also able to professionally self-determine [4, 10, 14].

An important aspect of the pedagogical work in higher education is the formation of professional thinking, the development of professionally significant personal qualities of future specialists. An effective factor at the present stage is the development of students’ motivation - the “trigger mechanism” in the learning process, increasing interest in the

chosen profession [10]. Attitude towards learning, as a means of achieving the goal, forms a stable level of the motivational and target basis of training - educational motivation. The structure of educational motivation is multi-valued in content and forms, is made up of students' assessment of various aspects of the educational process, its forms and ways of organization in connection with individual needs and goals [2, 6, 10].

Dominant or subordinate importance has the ability of students to learn, their desire or unwillingness: to get a profession (professional motivation); acquire new knowledge (cognitive motives); benefit society (broad social motives); have high wage (pragmatic motives); assert themselves and to have a certain place in the future in society as a whole and in the nearest social environment (motives of social and personal prestige), thereby determining a certain level of individual achievements in studies, and at the same time determining the degree of approximation to the ultimate goal.

The introduction of science to all spheres of life requires from young specialists not only theoretical knowledge, but also a creative approach to solving problems of various kinds. In connection with this, a modern specialist should possess not only the necessary amount of fundamental and special knowledge, but also the ability to properly assess emerging problems, quickly process existing information, supplement it with missing information, predict the results of professional activity, using his or her intellectual and creative potential [1, 2].

In the Dnepropetrovsk Medical Academy, there is a wide range of organizational forms of the educational process, including lecture, practical, laboratory, seminar classes, term and graduation papers, consultations, training and self-training.

In the Medical Biology, Pharmacognosy and Botany Department, students of such specialties as "Medicine" and "Stomatology" are trained in the first year, studying medical biology; students of such specialties as "Pharmacy" and "Clinical Pharmacy" study the fundamental (biology with the basics of genetics, pharmaceutical botany, including systematics, the fundamentals of biogeocenology) and special disciplines (pharmacognosy, resource management of medicinal plants, pharmacological bases of phytotherapy) during five years, as well as train in the field in pharmaceutical botany in the second year and practice in pharmacognosy in the third year. The main means to increase the effectiveness of teaching students at the department are to involve them in participation in various fields of activity in the university, including research activities, as well as educational work, taking into account the specifics of courses, human resources and social needs.

When studying disciplines, the student acquires not only theoretical knowledge, but becomes an active participant in research activity of the department. The purpose of this work is the acquisition by students of the research skill, which is a universal way of mastering reality. Students, actively participating in research projects and having considerable experience, have more chances of success, both in higher education institutions, and in understanding the material, and using it in practice.

One of the examples of the research work of students in the Medical Biology, Pharmacognosy and Botany Department is the student scientific circle, in which students

combine basic teaching methods (working with scientific literature, preparing abstracts, report, dialogue, practical work) with methodological techniques (slide demonstration, video, macropreparations, micropreparations when considering them under a magnifying glass and a microscope equipped with a camera and further image processing using computer software). The meetings of the circle are held on a monthly basis, with a great deal of attention being paid to developing a plan for the work of the circle by faculty members, who creatively approach to selection of topics for consideration at meetings of the scientific circle, trying to interest and supplement the knowledge of students of various specialties.

Thus, at one of the meetings of the circle, dedicated to the problem of helminthology, medical students, expanding the knowledge of student pharmacists, read out abstracts that examined the morphological features of the structure of the main representatives of flat and roundworms, their development cycles, pathogenetic action, methods of laboratory diagnosis, measures of prevention of helminthiasis, and future pharmacists talked about the use of certain medicinal plants (common pumpkin, wormwood, tansy, male fern) having anthelmintic activity. During this meeting, students used various thought operations: analysis, comparison, judgments, conclusions, and teachers helped to select exactly those that were appropriate to apply in each case.

Participation in the work of the circle develops interest in the studied subjects, raises the educational motivation, gives an opportunity to broaden the horizon, creates conditions for social and professional growth, the formation of logical, scientific thinking, the development of interest in the chosen profession. Referential messages contribute to the ability to correctly state their thoughts necessary in future practical activities, which requires not only to carefully listen to patients' complaints, but also to be able to conduct a competent dialogue with them.

In addition to theoretical informative reports, students prepare their publications, take part in student scientific events of various levels (department, faculty, region, national level): scientific conferences, contests of scientific and educational works of students, skill competitions in disciplines and specialties, take care of laboratory animals, participate in the manufacture of macroscopic drugs, and the most active ones take direct part in the implementation of research work of the department guided by a particular scientific advisor from the teaching staff. Scientific results, obtained by students, are published in scientific journals and conference collections in the form of abstracts and articles. Conduct of experimental studies, work with literature, preparation of reports, abstracts and articles, presentations, speaking at conferences, defending own opinion and protecting the research results, develop a creative personality and is a serious experience for students. Thus, the research work plays an important role in the development of creative abilities of students, but requires a constant attention from the teaching staff in order to find new forms of its organization.

High school is dedicated to develop not only professional knowledge, proficiency and skills, but also to promote the formation of a spiritual and moral personality, which is of particular importance for a medical university. The result of training should be

professional competence, which will integrate personal, spiritual and moral positions, as well as professional knowledge, proficiency and skills. It is just that combination of these qualities which will allow the doctor and pharmacist to realize humanistic values, take responsibility for their actions and participate in positive changes [1, 4, 5].

The main structural subdivision of the medical academy is a department, which plays a decisive role in the educational process, since it carries out the educational process, which has the greatest educational potential. It is just that department, especially the graduating one, which forms professional and intellectual competence of future specialists. In our graduating department of pharmacists, upbringing is not the simultaneous transfer of knowledge and value judgments from the teacher to the student, but their interaction and cooperation over the course of five years of training, both in classrooms and during the training practice.

The training and field practice in pharmaceutical botany involves acquaintance of students with various types of plant communities in nature, their general and medicinal floristic composition, peculiarities of their distribution, adaptation to different habitat conditions, significance in nature and people's life, as well as with the developmental features and a sanative role of plants in urbanization conditions [7]. The training and field practice in pharmaceutical botany includes two forms of conduct: field (experimental) and cameral (laboratory). The field form of the training practice includes acquaintance with the flora and plant communities of the region, collection of plants for herbarium. An important component of the experimental stage is performance by students of the independent research work, in particular: collection, drying plant material, mounting and design of herbarium; making herbarium collections "Fruits Classification", "Leaves Variety", "Inflorescences Variety", etc. The cameral form of the training practice includes the morphological description of plants and determination of the belonging of the collected plant to a certain taxon, mounting of herbarium, keeping practice diaries, writing an abstract and compiling a report on practice. The training and field practice in pharmaceutical botany is conducted in the form of thematic excursions with subsequent processing of the material.

The goal of the training practice on pharmacognosy is the formation of the general cultural and professional competencies in the field of professional activities of the specialist that includes practical pharmacy: during practice, students apply the theoretical knowledge, obtained in the department, for preparation, drying, storage, transportation, analysis, processing, application of vegetable raw materials, containing various groups of biologically active substances. They also master the basic methods of collection, herbarization, fixation, preparation for microscopy of plant objects, primary processing, standardization of medicinal vegetable raw materials of various morphological groups (leaves, grass, bark, fruits, seeds, underground organs), fix skills of determining plants, get acquainted with methods of determination of resources of wild medicinal plants in our region on the example of herbaceous, arboreal and shrubby plants. Ecological and morphological study of plants underlies all measures to protect plant objects, harvest medicinal plants, taking into account their rational use and reproduction, forming a

careful attitude to the environment [3, 7, 9, 11].

Methods of cultivation, agrotechnical approaches to cultivation of medicinal plants and care for them, peculiarities of cultivation are mastered by students in the pharmaceutical section of the department, which is one of the bases for conduct of the training practice of students of the second and third years of such specializations as “Pharmacy” and “Clinical Pharmacy”. The pharmacopoeial plot was created with the purpose of studying by students of medicinal plants in nature, in which they are represented: male fern (*Dryopteris filix-mas*), brandy mint (*Méntha piperíta*), garden lemon (*Melissa officinalis*), castor bean (*Ricinus commúnis*), garden sage (*Sālvia officinālis*), elecampane (*Ínula helénium*), creeping thyme (*Thýmus serpýllum*), common thyme (*Thýmus vulgáris*), common periwinkle (*Vínca mínor*), purple coneflower (*Echinácea purpúrea*), sedge cane (*Ácorus cálamus*), heart-leaved bergenia (*Bergénia crassifólia*), great nettle (*Urtíca dióica*), calendula (*Caléndula officinālis*), wild camomile (*Chamomilla recutita*), chokeberry (*Arónia mitschurínii*), cinnamon rose (*Rósa majális*), common fig (*Fícus cárica*), marsh mallow (*Althaéa officinālis*), May lily (*Convallária majális*), etc., having different pharmacological action: anti-inflammatory, anthelmintic, cardiotonic, hemostatic, choloretic, astringent, antiseptic, expectorant, etc. During the training practice, the theoretical material is not learned mechanically by the student, but it is tested in practice and fixed in form of practical skills as a result of observations, analysis, differential diagnosis of medicinal and non-medicinal plants, information retrieval in scientific and methodical literature. In our opinion, attracting students to the research work allows us to study the program material more deeply, it forms professional thinking, develops research skills, which helps to optimize the learning process in general. The environmental knowledge allows the future specialist to integrate the knowledge of theoretical and applied sciences the most effectively for the rational use of natural resources, and also with their help to more effectively form a system of professional knowledge. Herborized medicinal plants and possible admixtures to them, prepared during practice, are used later in the practical classes of the department.

To get acquainted with tropical and subtropical plants, excursions to the greenhouses of the Botanical Garden of the Oles Honchar Dnipro National University are conducted, where students get acquainted with the morphological, ecological and species diversity of vegetation in different climatic zones and countries of the world, with the practical importance of plants, with rare endangered species, edible and medicinal plants, such as: “relic” dawn redwood cone dissected, which was considered extinct, cabbage palmetto (growing on our land in the Neogene period), Manchurian aralia (ferruginous tree), araucaria, Japanese medlar, algaroba, *Cyphomandra*, mango, guava, feijoa, dates, bananas, avocado, magnolia, rhododendrons, yew, psidium and exquisite tall and low hamerops, flowering eugenia, black pepper, fern palm, exuding smell of jasmine *Pitosporum* and many other interesting and rare species. When students and teachers fall into this world of tropical plants, one does not know where to look first due to such beauty. In the subtropics section, there are magnolia, paper mulberry, carob, laurel, oranges, anonna-cheremoya, fig, eucalyptus, stone oak, camellia, Japanese fillets, an

excellent collection of succulent plants is made. In the world of tropical plants - many kinds of palm trees, for example, the Canary palm, planted in 1926, even before the creation of the botanical garden - the “elder” plant of the greenhouse will soon celebrate its 100th anniversary.

The students get acquainted with the role and characteristics of the development of woody plants in urbanization when they become acquainted with the vegetation of city parks, named after Taras Shevchenko and Lazar Globa, in which more than 70 species of shrub and tree plants grow. In urban areas, during practice, weed is also studied for weed vegetation, biological features and weed adaptation to spreading. More attention is paid to the study of roadside weeds (common dandelion, greater plantain, goose grass, knotgrass, creeping trefoil, blindweed), and actually deserted (woolly burdock, large and small, great and annual nettle, green ginger, horseweed, sweet and common clover), having medical value.

In order to get acquainted with plants typical not only for our region, but also the country, excursions to national parks of Ukraine are conducted, for example, to Sofiyivsky Park, which is also a research institute of the National Academy of Sciences of Ukraine, where students get acquainted with 3,323 species, forms, varieties of local and exotic trees and shrubs. Foreign students from Palestine, Syria, Lebanon, Morocco, Tunisia, Uzbekistan, Israel especially remember the trip to the unique biosphere reserve “Askania-Nova”, which was created on the site of the fescue-feather grass steppe, during the vegetation of various feather grass species, reminding them of a rolling sea. The local ecosystem has been untouchable for millions of years, it is the only such steppe site not only in Ukraine, but throughout Europe. In the arboretum “Askania Nova”, students had an opportunity to get acquainted with more than 1,000 species of plants of the East and Central Asian, Mediterranean, North American, Euro-Siberian flora.

Excursions to experimental sites and fields of scientific research institutions, engaged in the cultivation of medicinal plants most fully introduce species, used in medicine and other branches of the national economy. Thus, teachers of the Medical Biology, Pharmacognosy and Botany Department during the botanical and pharmacognosy training practices conducted an excursion to the botanical nursery of the research station of the National Academy of Sciences of Ukraine in the village of Berezotocha in the Lubensky District of the Poltava Region, where the priority objects of study were the species listed in the Red Book of Ukraine (bear’s onion, mountain arnica, yellow gentian, spring adonis), and species that grow in subtropical climatic zones (treelike aloe, mountain knotgrass, *Withania Somnifera*, ground lemon, alpine hedsarum, Baikal skullcap, common licorice, spiny eleuterococcus, etc.), in general the collection of botanical nursery has 379 medicinal plant species belonging to 66 families. During this trip to the Poltava Region, students visited not only the “living laboratory” for growing and studying the biological features of traditional and new types of medicinal plants, they rested, but also got acquainted with the cuisine, culture and traditions of the Ukrainian people. Having visited the museum of the Ukrainian wedding in the village of Velikie Budishcha - a house that used to be the property of an ordinary village family, where the unique interior

of the courtyard of the traditional Poltava village was preserved, students got acquainted with the wedding decorations of different times, objects of everyday life, embroidered shirts and towels, they bought souvenirs. In addition to visiting the museum, students became direct participants in the theatrical performance - the ceremony of the Ukrainian wedding, where each guest had his own unique role (bridegroom, bride, bridesmaids, mother-in-law, good-mother, etc.). In the entertaining historical and cultural complex on the small village of Proni near Dikanka, which supposedly served as a prototype of what was described by N. Gogol in the story "Evenings on a Farm near Dikanka" students plunged into a rural, soulful atmosphere, experienced traditional Ukrainian hospitality and tasted the culinary treasures of Ukraine, which we are rightfully proud of - the famous Ukrainian borsch, fat, vareniki and dumplings, homemade sausage, homemade roast, potato cakes and benderyki. Joint trips of Ukrainian and foreign students contribute to the strengthening of interethnic relations, create favourable conditions for students in order to communicate outside the classroom, broaden their horizons, and develop a sense of aesthetic perception of the world around them. Teachers of the department unite the educational and cognitive components of the educational process during the practice and try to make them memorable and interesting, consolidating the acquired knowledge, form the norms of correct behaviour, careful attitude to nature and the ability to assess not only the beauty, but also the fragility of the entire ecological system, to which human beings belong themselves.

Any novice specialist, regardless of the specialization and nature of the work, must have fundamental knowledge, professional skills and proficiency of his profile, experience in creative and research activities to solve new problems, experience in social and assessment activities [1, 10, 11]. The necessary experience is formed in the process of independent work of students, which along with the classroom is one of the forms of the educational process and is an essential part of it. The ratio of time, allocated for classroom and independent work worldwide is 1:3.5 and is intended not only for mastering each discipline, but also for the formation of skills of independent activity in the academic, scientific, professional spheres, the ability to assume responsibility, independently solve problems, find constructive solutions [4, 11].

A promising direction in the development of the creative abilities of the personality, which is necessary for a future specialist in medicine and a pharmacist, is problem training, which allows solving non-standard tasks, learning new skills and competences. The main result of this method of education is the formation of professional thinking of students. Problem training is that the teacher does not present the material in ready-made form, but poses problems for the student, prompting them to look for ways and means to solve them. Solving the problem requires the inclusion of creative thinking [10, 14].

One of the new forms of effective learning technologies from the point of view of forming key competencies in the study of medical biology, pharmaceutical botany, pharmacognosy and resource management of medicinal plants is the case study, which is based on the fact that students independently and in the group should analyse the description provided of any real economic, social and medical, everyday, organizational,

managerial or other case, highlight the problem, offer its solution [2, 13, 15]. This meets the requirement of time in preparation of future doctors and the processes of integrating medical education into a single educational space in Europe. When working with a case, students search, analyse additional information from different fields of knowledge, including those, related to the future medical profession. The application of this method in training allows us to shorten the gap between theory and practice, develop cognitive, intellectual activity of students, analytical abilities, and also to develop skills - to assess the situation, choose key information, formulate queries correctly, forecast the ways of situation development, make decisions in conditions of uncertainty, criticize, respond constructively to criticism, ask questions. The case method provides high efficiency of training and development of future specialists, reducing the number of “passive” and insecure students, forms certain personal qualities and competences, enables the teacher to improve, think differently, act, renew own creative potential. The method used is based on the unity of the didactic principles: the individualization of the approach to each student; sufficient number of demonstrative materials; freedom in learning; formation of skills of independence, self-organization, ability to work with information; highlighting the main provisions of a large volume of theoretical material; development of positive and necessary for further improvement qualities of the future qualified employee [15, 16].

This method is used in teaching students of medical and pharmaceutical specialties [6, 8, 12, 16]. The teacher divides students into microgroups (teams), 5 persons in each are assigned a captain - a student, who takes responsibility for making a team decision. The leader of each team receives a briefcase and a list of recommended literature, after studying which and discussing with the team, students are able to voice the solution of the problem (issue). In the practical class, “Hereditary Diseases” in medical biology, students after the study of the case should diagnose certain syndromes: Edward’s, Down’s, Patau’s, Klinefelter, Pradera-Willi, Wolf-Hirschhorn and others. For the diagnosis of chromosomal diseases, students should:

1. To determine the clinical picture of this anomaly after visual examination of photographs of people with certain chromosomal diseases and their description.
2. To apply genetic methods of research, in particular:
 - a) karyotyping - for the study of chromosomes in peripheral blood lymphocytes according to micropreparations with the subsequent making of karyotype;
 - б) dermatoglyphics - to study features of skin fingerprints (dactyloscopy), palms (palmoscopy) and soles of the feet (platoscopy), on the basis of which the diagnosis is established.
3. To characterize a chromosomal or genomic mutation (aetiological principle):
 - a) individuality of the anomalous chromosome or its site;
 - б) type of mutation (monosomy, trisomy, polysomy, full or partial)
 - в) degree of mosaicism of the organism;
 - г) genotype of the organism;
 - д) influence of environmental conditions (embryonic or postnatal).

After discussion of the case material by all the students, the captain makes the only correct decision - determines the syndrome, while students actively express their thoughts and argue the result. As a task, the teacher offers students to prepare a presentation on this syndrome for the following session.

The case method is also used during training of students of pharmacists [17]. For example, in order to determine the species affiliation of plants, a set of diagnostic features (features of the root system, morphology of the stem, leaf, inflorescence, fruits) for which they classify the herbarium sample provided to students in a practical lesson on pharmaceutical botany. In classes on pharmacognosy, with the help of prepared cards with chemical formulas of the main groups of biologically active substances, medicinal forms of phytopreparations, herbarium specimens of medicinal plants and medicinal plant raw materials, students construct logical series by logical inferences and comparisons: drug raw materials (grass, fruits, flowers, etc.) → production plant → group of biologically active substances → pharmaceutical activity → herbal formulation. They also offer raw materials with identical (similar) pharmacological action, find the herbarium sample of the plant, impurities to it.

Using the method case in the process of training of future doctors of pharmacists in our department stands out among other teaching methods in that it updates students with a certain set of already acquired knowledge from other academic disciplines, helps overcome stereotypes of thinking, and the teacher does not simply state the material, but poses the problem, formulates a cognitive task, and then, revealing the system of evidence, comparing points of view, different approaches, helps students to find a way to solve the set back task and search ways of this method.

Training of highly qualified specialists, who are ready to carry out their professional activities in a high-tech, competitive world, capable of solving problems, arising in any kind of professional activity, requires extensive use of active and interactive teaching methods in the educational process. In all fields of medicine and pharmacy, specialists are in demand, which are able to work effectively in a team, generate ideas and develop technologies for their implementation, active people are required, thinking and being able to analyse large amounts of information. The task of the teacher is to bring the learning situations closer to the future professional activities of a doctor and pharmacist.

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