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Introduction

- 1 Integration of the high education ensuring into the European education space is one of the main directions of work for all Ukrainian high education institutions. For higher authorities in this area, it is important to form and improve legal regulations to ensure the quality of education.
- 2 High education traditionally defined as a result of a consistent, systematic and purposeful process of learning the content of education acquired by a person. It ends with obtaining a certain qualification based on the results of the state certification.
- 3 State policy in the field of higher education is based on the following principles:
 - accessibility and competitiveness of obtaining high education;
 - preservation and development of achievements and traditions of Ukrainian high education;
 - state support for specialist preparing;
 - transparent structure of the educational and professional training of professionals (Botezat, 2023; Brander et al., 2023).
- 4 **The article purpose** is to analyse the problem of learning outcomes changes during the martial law.

Results

- 5 **The integration of the content, forms and methods of medical education.** One of the important means of improvements of professional education is, in our opinion, the integration of the content, forms and methods of education, during the

implementation of which didactic process are more actively projected as new achievements of science and technology, as well as professionally significant one's components of professional training (knowledge, abilities, skills, mindset of a future specialist).

- 6 At the basis of such integration are real processes of mutual penetration of sciences, reflection of important achievements in sciences, for example, biology and physics, biology, and chemistry, etc. A characteristic feature of the interaction of natural and medical sciences is that they have a common object of research – human as a living organism.
- 7 Interdisciplinary integration also includes, in addition to content, specific research methods natural and medical sciences, ways of thinking, characteristic for certain fields of knowledge, etc. The integration of separate fields of knowledge is one of the promising didactic tools of professional secondary and higher education, when it is necessary to direct the study of general education. Discipline formation thorough professional knowledge and skill.
- 8 One of the urgent problems of natural science training in higher medical education in our opinion is that the school needs to develop a holistic theory of didactic integration of students' knowledge and skills on the basis of general and special education subjects cycles, which cannot be gained neither by a simple extended implementation of intrasubject connections reflecting only about remedial aspects of integration, nor by direct copying of experience of other countries, nor, in the end, an eclectic combination of multidisciplinary knowledge and skills.
- 9 To increase the level and quality of knowledge based on an integrative approach to the organization of the educational process, it is necessary to consider the theoretical foundations principles of integration and special features a specific educational institution. The identification of such specificity and its coordination with the general provisions of the theory of others integration is one of the most important tasks of modern didactics.
- 10 One of the most important of them is how professional thinking in medicine is developed, elements of which should be formed based on the integration of knowledge and skills with natural and clinical disciplines throughout the process training, including periods of pre-university training and postgraduate studies. The task of integration in education we see the process, right in front of us, in the unification of all its links into a didactic system, which would ensure the receipt of not a simple set of fundamentals knowledge, and their complex, which can be used creatively have a professional activity.
- 11 **Teaching medical and biological disciplines.** The generalization of the analysis of the curricula shows that medical and biological disciplines (Human anatomy, Medical biology, Histology, Physiology) and others are taught in 1-2 courses.
- 12 Biological disciplines are the theoretical basis of medicine and create a basis for the formation of relevant knowledge, skills, and abilities for training of the future doctor. Of course, it is necessary to achieve the goal an intensified, well-founded teaching method, which would be aimed at the student obtaining the maximum possible amount of information and forming the knowledge necessary for a specialist, practical skills, and this requires the use of effective methods, technologies of training and control.

- 13 According to the provision that the educational elements of any topic are part of one of the systems, the system is part of the organism, and the organism is a connecting link between a person and the environment, the subject of study of an educational discipline is the structure of the organs and systems of the human organism in the norm. Thus, the goal of teaching the educational discipline “Normal human anatomy” is to form students of the medical faculty majoring in “Medicine” a holistic view of the structure and functioning of the working, life-supporting and integrating systems of the body (Department of human anatomy, 2022).
- 14 The subject of study of the educational discipline “Histology, cytology and embryology” is the microscopic and ultramicroscopic structure of cells, tissues, and organs of the human body. The result of the study of the development and changes in various conditions of cells, tissues and organs of the human body is the ability to evaluate information about the diagnosis in the conditions of a health care institution based on laboratory studies (Department of histology, 2022).
- 15 The subject of the study of physiology is the functions of a living organism, their connection with each other, regulation and adaptation to the external environment, origin, and formation in the process of evolution and individual development of an individual. The purpose of teaching the discipline “Physiology” is the formation of general knowledge about the mechanisms of functioning of human body systems to ensure homeostasis in interaction with the external environment (Department of pathological physiology, 2022).
- 16 **Students’ learning outcomes.** As a result of a completing a course students should be able to demonstrate learning outcomes. They consist of knowledge, abilities, skills, ways of thinking, views, values, personal qualities. They are acquired in the conditions of formal education, non-formal education and informal education. They can be identified, planned, evaluated, and measured. The education student can demonstrate them after completing the educational program (program learning outcomes) or individual educational components.
- 17 Learning outcomes should be:
- Specific (provide sufficient detail, written in plain language).
 - Objective (formulated neutrally, avoiding subjectivity and ambiguity).
 - Achievable (realistic in terms of time and resources required to achieve them).
 - Useful (should be perceived as corresponding to the level higher education and the requirements/expectations of civil society).
 - Appropriate (meet the qualification requirements).
 - Have the nature of standards (determine the standard requirements that must comprehend the student).
- 18 Learning outcomes are considered during the procedures for evaluating the quality of education. They are used in the accreditation of educational programs and institutions of high education, as well as in the processes of verification of authenticity and recognition of qualifications. They are also used as a unified toolkit for describing the specialist’s qualifications. This helps to make them more understandable for different educational institutions, employers and those who assess them. It also helps ensure the academic mobility of students and simplifies the credits transfer. It provides the opportunity to learn throughout life, as well as to implement the students’ learning trajectories within educational systems and between different systems.

- 19 Understanding and practical application of learning outcomes is a prerequisite for the successful implementation of ECTS (European Credit Transfer and Accumulation System), an addendum to diplomas of the European model, recognition of study periods (ECTS Users' Guide, 2005).
- 20 Benjamin Bloom and his colleagues in 1956, highlighted six levels of learning. It was first classification with list of skills that investigate understanding in each level. In 2001, Anderson, Krathwohl and colleagues revised the taxonomy. This change includes terminology (nouns changed to verbs to indicate action as thinking demonstrate active engagements); structure (top level is creation of new ideas and thoughts https://www.researchgate.net/figure/The-change-of-the-Blooms-taxonomy-into-Andersons_fig1_335500776 as more complex form), emphasise (more universal), figure 1.

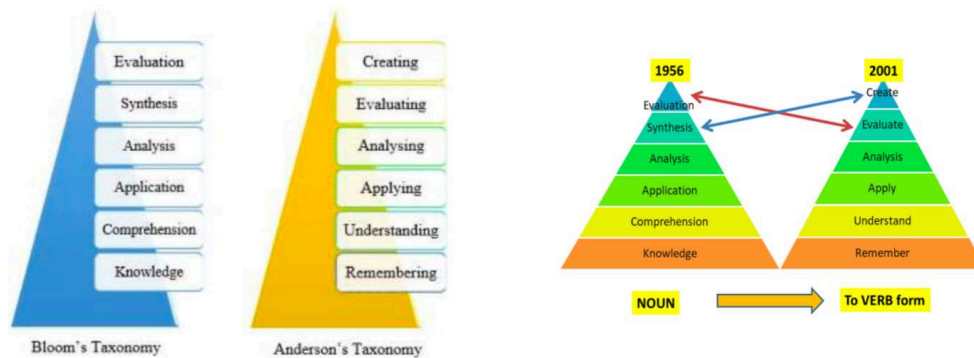


Figure 1. Different taxonomies and term changes from 1956 to 2021.

- 21 Learning outcomes are debated by a few scientists (Allan, 1996; Davies, 2002; Hussey & Smith, 2003; James & Brown, 2005; Ewell, 2005; Buss, 2008; Hussey & Smith, 2008; Nusche, 2008; Spady, 1988; Spady & Marshall, 1991; King & Evans, 1991; Brady, 1996; Capper & Jamison, 1993; Hargreaves & Moore, 2000; Jessup, 1991; Burke, 1995).
- 22 We agree with definition of Learning outcomes as a set of observable and demonstrable statements about what the learner knows and understands at the end of the learning course (Yueng & Ong, 2012).
- 23 There are program learning outcomes of the graduate educational program a set of statements about what a student is expected to know understand and be able to demonstrate after he has performed all assignments and passed all exams/assessments as well received a degree.
- 24 The concept of “programmatically learning outcomes” is connected with learning outcomes, which specify it, play a key role in the processes of verification of authenticity and recognition of qualifications. They provide an understanding of what the student knows, understands and is capable of demonstrate upon successful completion of the evaluation period educational achievements that led to obtaining a qualification. Associated with the corresponding cycle level descriptors.
- 25 Thus, the topic of our research is learning outcomes as a result of studying a number of disciplines of the medical-biological cycle at a medical university. Among them, we have chosen for comparison those that are presented in the winter session of the 2nd year: Anatomy, Histology, cytology and embryology and Normal physiology.

- 26 The tasks of the research were to determine the main concepts, such as the subject of study in a higher educational institution, the results of study as the completion of the study program and changes in them related to the martial law.
- 27 We also pay attention to those forms of training that become the only possible in a martial law situation, in particular asynchronous training and its features.
- 28 As research methods, we have chosen both general – analytical, generalization, functional, and special ones, such as grouping, graphic, and correlational.
- 29 **Anatomy course.** Thus, at the end of the *Anatomy course*, 2nd year students should have the following learning outcomes:
- 30 Check of knowledge:
- the structure of the human body;
 - the systems that form organs and tissues based on modern achievements;
 - macro- and microscopic anatomy;
 - X-ray anatomy;
 - individual reproductive and age characteristics of organs and systems;
 - anatomical and topographic relationships of organs;
 - variability options;
 - developmental anomalies;
 - interdependence and unity of structures and functions of human organs.
- 31 Be able to: interpret the results of clinical research methods:
- radiography;
 - radioscopy;
 - computed tomography;
 - magnetic resonance tomography;
 - ultrasound;
 - endoscopy;
 - to solve standard, typical and complicated professional tasks that have a clinical and anatomical basis;
 - make anatomical preparations (Department of human anatomy, 2022).
- 32 **Histology.** *Histology* the student should know:
- microscopic and submicroscopic structure of cells, tissues and organs.
- 33 Be able to: solve situational problems that have a clinical direction,
- interpret morpho-functional relationships, structural and molecular determinants of various processes in the human body (Department of histology, 2022).
- 34 **Normal physiology.** *Normal physiology*: students should know:
- methods of physiological research;
 - functions of body organs and systems;
 - mechanisms of their regulation and adaptation to the environment.
- 35 Be able to:
- draw conclusions about the state of physiological functions of the body, systems, and organs;
 - analyze the age-related features of body functions and their regulation;
 - analyze the regulated parameters and draw conclusions about the mechanisms of nervous and humoral regulation of the physiological functions of the body and its systems;

- to explain the physiological basis of the methods of researching body functions;
 - to explain the mechanisms of the body's integrative activity.
- 36 **Integral, general, and special competencies in programs.** Even though each program contains integral, general, and special competencies, the existence of program competencies is logical. If an integral competence for the discipline “Normal Physiology” is, for example, the ability to solve typical and complex specialized tasks and practical problems.
- 37 General competencies are the ability to think abstractly, analyze and synthesize; ability to apply knowledge in practical situations; knowledge and understanding of the subject area and profession; the ability to learn and be modernly educated; ability to adapt and act in a new situation; ability to make informed decisions; the ability to be critical and self-critical; ability to work in a team.
- 38 The ability to act based on ethical considerations, to be aware of equal opportunities and gender issues, value and respect diversity and multiculturalism.
- 39 A specialist is a narrow competence: the ability to determine the necessary list of laboratory and instrumental studies and interpret the results.
- 40 Program learning outcomes will be slightly different from the following: making informed decisions; solving complex tasks and problems; establishing a preliminary and final clinical diagnosis of the disease; appointment of laboratory and/or instrumental examination of the patient.
- 41 Carrying out differential diagnosis of diseases; establishing a diagnosis of an emergency; carrying out measures for the organization and integration of medical care; formation of collective responsibility for performance results; implementation of preventive and anti-epidemic measures against infections and diseases; determination of the nature and principles, regime of work, rest, and diet of treatment of diseases; determination of the tactics of managing the contingent of persons subject to dispensary supervision; determination of the tactics of conducting normal and pathological childbirth and the postpartum period; determination of tactics and provision of emergency medical assistance; assessment of the influence of socio-economic and biological determinants on the state of health of an individual, family, and population; assessment of the impact of the environment on the health of the population (Department of pathological physiology, 2022).
- 42 The transition to online education took place in the 2020-2021 academic year due to the coronavirus epidemic as all over the world. Different training platforms were tested accordingly, and MS Teams platform was chosen as the base one.
- 43 The Ministry of Education and Science of Ukraine has prepared information on the specifics of the organization of the new 2022/23 academic year and recommendations for priority steps in preparation for it.
- 44 **The influence of a full-scale military invasion.** A full-scale military invasion with the occupation of a part regions and regular aerial bombardment of the entire territory of Ukraine caused the forced displacement of residents not only in within the borders of the state, but also outside it. Therefore, in part, and in some universities in full, not only students, but also the educational and teaching staff changed places stay.
- 45 Under the given circumstances, distance educational provision the process will depend only on the availability of online access to the network the Internet, which is usually

available in the territory where active hostilities are not are held. This approach will allow to preserve personnel potential, communication with students, and most importantly, to secure it as much as possible participants.

- 46 The organization of the educational process depends on the security situation in each settlement. The structure and duration of the academic week, as well as the forms of organization of the educational process are determined by the academic council of the educational institution within the time limit provided by the educational program (in accordance with the volume of the educational load and considering the peculiarities of the region, etc.).
- 47 Educational process in remote mode introduced in educational institutions in the territory of hostilities and temporarily occupied territories. It is introduced by order of the founder of the educational institution in agreement with the head of the administration.
- 48 In the remote form, the work can be performed by the teacher outside the workplace, in any place of the employee's choice and using information and communication technologies.
- 49 The mixed form combines face-to-face and remote modes. This combination is suitable for various classes: practical and laboratory classes can be conducted face-to-face, lectures - remotely.
- 50 Our university is recommended by the military-civilian administration as a remote form of education, considering the presence in the front-line territory.
- 51 **There problems of remote learning.** There are several problems related to the remote learning. First, there is no Internet, or there is no possibility to connect to the Internet of the participants of the educational process. As noted above, many people are forced to leave their homes due to hostilities homes and move to another safer place for life residence where there are no Internet resources.
- 52 Secondly, a certain amount student of higher education does not have the opportunity to study remotely, in connection with their volunteer activities or work to provide for the family when other family members have lost their jobs. Thirdly, there is unscrupulous students who take advantage of the difficult situation in Ukraine and skip classes for no reason. However, find out the circumstances under which they miss remote classes there is no way.
- 53 Fourthly, many students are in the temporarily occupied territory by Russian Federation. Here many questions arise regarding the training of such applicants and completion of the academic year or studies in general and obtaining a diploma.
- 54 According to the definition of scientists, multimedia learning technologies are such an organization of speech communication of learning subjects, which provides, in accordance with the goals of learning, the individual characteristics of those who learn, the most rational complex application of methods, techniques, means and forms of learning to achieve a pre-planned appropriate level foreign language communicative competence.
- 55 Analysis of distance learning as a form of organization of the educational process allows us to determine its characteristic features: 1) free access to educational information; 2) flexibility of the knowledge presentation structure; 3) asynchrony of learning; 4) communicativeness of education; 5) internationality of education; 6) the

new role of the teacher as a consultant and coordinator of the educational process; 7) “autonomy” of the student, who himself determines the means of learning, the time and place of studying educational material (Koval, 2012).

- 56 Pre-developed additional online and self-paced courses have been integrated into the basic platform. Programs, syllabuses, calendar-thematic plans, and methodological developments of each department were posted on the university’s website in Sharepoint format.
- 57 Texts of lectures and their recordings are additionally posted. All of this is available for download by students after logging in with the login and password that every student at our university has.
- 58 Since February 2022, the stable and established work system had to respond to new circumstances again. According to the recommendations of the Ministry of Education and Science of Ukraine, Zaporizhzhia State Medical and Pharmaceutical University finally chose not only a synchronous, but also an asynchronous form of education, which allowed those who are abroad, in the occupied territories or, ultimately, to participate in classes does not have the technical ability to join classes.
- 59 **Teaching and learning in the front-line zone.** Training in the front-line zone had a big impact on the work of the entire university: the rectorate, dean’s offices, departments, and other services. Refugees live in most student dormitories, departments and deans constantly monitor not only students’ attendance and academic performance, but also their whereabouts to find out the possibility of accessing the Internet, mobile communication and, unfortunately, information about whether students are alive and safe, since most of the contingent is in the occupied territory and the relevance of the information changes every week.
- 60 Students who are abroad and often move have certain technical difficulties. Most of the groups are extremely united: not only all-important relevant information about studies is promptly transmitted, but also constant help is provided to each other in studies, constant communication, especially with those who are in difficult circumstances.
- 61 Senior year students (5th and 6th) actively work in hospitals, emergency services, including on a volunteer basis, gaining real experience that they would not have in regular practice.
- 62 Foreigners who studied at our educational institution before the start of the war actions were forced to evacuate for their safety. War deprived learning opportunities for some of them at all. The rest are foreign students continued to receive education in a distance or mixed form (mobile groups), which limited them in full-time education. Some of them are forced to return to their country.
- 63 We present the results of the winter examination session in the pre-war (2021) and post-war period (2023) for comparison. For example, we chose exams of the 2nd course of specialization “Medicine”, because they pass anatomy and histology as exams in the winter session.

Course	Subjects	Academic year	Number of students	Absolute progress	Qualitative progress	GPA
2	Human anatomy	2021-22	93	89,13	80,44	4,1
		2022-23	72	97,29↑	89,19↑	4,4↑
2	Histology, cytology, embryology	2021-22	93	91,30	66,31	3,81
		2022-23	72	100↑	77,78↑	4,0↑

Table 1. Results of the winter session.

- 64 As we can see, the number of students in the 2nd year has decreased due to the stay of some of them abroad and the receipt of academic leaves for the period of martial law. The table shows that absolute, qualitative success and the GPA has increased.
- 65 On the one hand, an increase in absolute and qualitative success is a good indicator. But this is under normal conditions. We see an increase in indicators compared to the period when, due to the coronavirus epidemic, such training took place remotely. Thus, the increase speaks of the opposite process, namely, the mass use of the Internet and the ability to find “workarounds” for completing tasks.
- 66 After analyzing the situation with the winter session, most of the departments came to the conclusions about the need to revise the forms of admission exams from the test in favor of using various types of tasks and oral interviews with the use of a camera. And only a decrease in indicators to the usual level can indicate the success of the preparatory work.
- 67 The ability to use GPT chat significantly complicates the educational process, and therefore affects the learning results. To make it impossible to use it in the educational process, the forms and types of tasks should also be revised.
- 68 **Students and teachers’ psychological problems.** With the beginning of the war, several psychological problems arose among students and teachers, which significantly affected the results of their studies. The result was a constant state of stress.
- 69 There are three forms of reaction to stress, and we observe them to varying degrees in students. This is fight or flight when mobilization energy is spent on fighting or fleeing. The second is freezing or the so-called traumatic forceps. At the same time, the longer the threat lasts, the more serious the consequences may be. This is how a traumatic condition can develop, which later turns into post-traumatic stress disorder. The third is the loss of a sense of reality. And finally, the fourth is the discontinuity of the ability to perceive.
- 70 The last phases of exiting the crisis are the phase of exiting the crisis, during which the sense of reality is restored, cognitive thinking is turned on, the process of understanding the reasons and explanations of what happened, attempts to find the meaning of the event that is happening, and the understanding of the forgotten experience, and the reorientation phase, when new interests, plans for the future, restoration of self-respect and confidence appear.

Conclusion

- 71 It should strengthen the necessary skills and abilities of higher education seekers for their life and mutual understanding with other people; to resolve conflicts; for

collective work and planning with other general purposes and common future; to respect pluralism and diversity (for example, gender, ethnicity, religion, and culture), as well as for active participation in society.

- 72 Should also help mastery methods of cognition: the main means of teaching communication and speaking speech, literacy, setting and solving problems; to get how general and in-depth knowledge in several areas; to understand rights and responsibilities, and most importantly, to learn to learn (Botezat, 2023).
- 73 Thus, despite certain problematic issues regarding distance learning, it makes education more accessible, but, choosing it, we should not choose between affordability and quality. Higher education should be available to all based on each person's ability.
- 74 Learning outcomes are focused on what should demonstrate (knows, understands, is able to do) the student after completing studies. According to the national classification, learning outcomes are competencies (general and special).
- Learning outcomes are intended to provide Sufficiently complete information to determine precisely what students will be able to achieve after successful completion of the program.
 - Advisor for help in choosing individual modules and programs in general, which will increase the effectiveness of training.
 - Complete and understandable information for employers and educational institutions (in the case of continuing education at a higher level) regarding the content received education and acquired competences in the context of this specialty.
- 75 Help in the development of academic mobility:
- 76 Contribute to the academic mobility of students, because significantly facilitate the recognition of received qualifications.
- Improve the comprehensibility of qualifications.
 - Simplify credit transfer.
 - Provide a certain standard format that helps implementation lifelong learning, and creates opportunities for implementation to learners, their own learning trajectories within and between different educational systems (ECTS Users' Guide, 2005).
- 77 In addition, psychologists believe that a person who has experienced traumatic events and processed these experiences grows personally. Greater self-confidence appears, rethinking of spiritual beliefs, greater value of life, reconsidered priorities, etc.
- 78 As a result, we can say that the war adjusted in education in our university and the country as a whole and continues to contribute. We will see the result only later the end of hostilities and we will be able to see in comparison how much has changed educational process during and after the war. Now we can say that Ukrainians continue life in the conditions in which they are, regardless of the circumstances, they are fully studying and hope for a quick end to the war.

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ABSTRACTS

The article is devoted to the problem of learning outcomes changes during the martial law. The attention is paid to the subjects of the medical and biological fields. Medical subjects which students pass in the winter session have been selected. The comparative characteristics of the average score, absolute and qualitative success according to the results of the students' exams were conducted. The main reasons for the change in study results related to the state of the martial law in Ukraine and the location of the university in the front-line territory have been determined.

Cet article est consacré au problème des changements dans les résultats d'apprentissage pendant l'état de guerre. Une attention particulière est accordée aux matières des domaines médicaux et biologiques. Les matières médicales que les étudiants passent lors de la session d'hiver ont été analysées. Cet article analyse les principales raisons du changement des résultats d'études liées à l'état de guerre en Ukraine et à l'emplacement de l'université en territoire en première ligne des combats.

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Mots-clés: résultats d'apprentissage, domaines médicaux et biologiques, apprentissage à distance

Keywords: learning outcomes, medical and biological fields, distance learning

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