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## ABSTRACT

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## INTEGRATION OF THE ART INTO THE STUDY OF ANATOMY: THE EXPERIENCE OF THE PEDAGOGICAL INITIATIVE OF THE COMPETITION «IMAGO ANATOMICA»

**Introduction.** Modern medical education requires innovative approaches to teaching basic disciplines, including anatomy. It is especially important to create a favourable emotional environment for learning during wartime, stress and social instability. Since 2016, teachers at the Department of Morphology of the Academic and Research Medical Institute of Sumy State University (ARMI SSU) have introduced a creative anatomical competition «Imago Anatomica», which combines the study of anatomy with art. Participants of the competition create individual or group works in the form of sculpture, embroidery or drawing, embodying anatomical structures through the creative awareness.

**Methods.** The study used methods of pedagogical observation, qualitative analysis of competition works, and questionnaires of participating students.

**Results.** Participation in the competition contributed to better mastering of complex anatomical topics due to active learning, increased interest in the subject, and improved learning skills. Constant interaction of students with the tutor ensured accuracy in the depiction of anatomical material and its detailed processing.

The creative approach and the opportunity for self-expression encouraged students to the learning process, supported their motivation and activity. The interaction between students was also improved, which contributed to the effective involvement of foreign participants in the learning environment.

**Conclusions.** The «Imago Anatomica» competition became a convincing example of the effective integration of art into the process of studying anatomy. This contributed not only to better learning, but also to the development of analytical thinking, a creative approach and learning motivation.

In the conditions of a full-scale war, the competition acquired special significance, as it created a favorable educational environment. Such an initiative helped students to remain involved in the educational process, to maintain active interaction with classmates and teachers. Thanks to this, the participants were able not only to improve communication, but also to effectively integrate foreign students into the educational environment.

**Keywords:** medical education, anatomy, learning process, competition, art, students.

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## ВПЛИВ ТВОРЧОГО КОНКУРСУ «IMAGO ANATOMICA» НА КОГНІТИВНУ АКТИВНІСТЬ І ПСИХІЧНЕ БЛАГОПОЛУЧЧЯ СТУДЕНТІВ ПІД ЧАС ВИВЧЕННЯ АНАТОМІЇ

**Вступ.** Сучасна медична освіта потребує інноваційних підходів до викладання базових дисциплін, зокрема анатомії. Особливо актуальним є створення сприятливого емоційного середовища для навчання під час війни, в стані постійного стресу та соціальної нестабільності. З 2016 року на кафедрі морфології Навчально-наукового медичного інституту Сумського державного університету (ННМІ СумДУ) запроваджено творчий анатомічний конкурс «Imago Anatomica», який поєднує вивчення анатомії з мистецтвом. Учасники конкурсу створюють як індивідуальні, так і колективні вироби у вигляді скульптури, вишивки або малюнку, втілюючи у них анатомічні структури через креативне усвідомлення.

**Методи.** У дослідженні використано методи педагогічного спостереження, якісного аналізу робіт, анкетування студентів-учасників.

**Результати.** Творчі заходи, зокрема ліплення, малювання, вишивка й змішані техніки, сприяли не лише кращому засвоєнню складного анатомічного матеріалу, але й формували стійкі когнітивні зв'язки, розвивали творче мислення, емоційний інтелект та мотивацію до навчання. Постійна робота студентів із викладачем-куратором забезпечувала точність у відображенні анатомічного матеріалу та глибину його опрацювання. Завдяки створенню сприятливого навчального середовища, студенти мали змогу знизити рівень стресу, відчути підтримку, об'єднатися навколо спільних цінностей. Творчість і самовираження стали засобами психологічного розвантаження студентів та викладачів в умовах воєнного стану. Покращилась комунікація між студентами та інтеграція іноземних учасників.

**Висновки.** Конкурс «Imago Anatomica» став переконливим прикладом ефективного інтеграції мистецтва в процес вивчення анатомії, трансформуючи академічне навчання в живий, емоційно насичений і пізнавально глибокий досвід. Участь у конкурсі сприяла стимулюванню когнітивної активності, підвищенню мотивації до навчання та розвитку емоційної стійкості. Особливої цінності конкурс набув в умовах повномасштабної війни, коли психоемоційна підтримка студентів стала не менш важливою за академічну підготовку. Подальше дослідження перспектив цього методу може сприяти його впровадженню на міждисциплінарному рівні, включно з міжнародною академічною співпрацею.

**Ключові слова:** освіта, анатомія, мотивація, конкурс, мистецтво, студенти.

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## ABBREVIATIONS

ARMI – Academic and Research Medical Institute;

SSU – Sumy State University

## INTRODUCTION

One of the challenges facing medical education, especially in times of war and difficult circumstances, is the search for new teaching methods that ensure effective learning and support active learning activities of students. In addition to traditional teaching approaches, the use of artistic methods contributes to the development of creative thinking, improvement of practical skills and integration of acquired knowledge [1].

For about ten years, the Department of Morphology of the Academic and Research Medical Institute (ARMI) of Sumy State University (SSU) has been implementing innovative methods of teaching anatomy, combining traditional academic approaches with creative techniques: sculpting anatomical structures, embroidering pictures on anatomical subjects, and drawing. This approach was first introduced in 2016, with the active participation of foreign students. Despite the challenges associated with the full-scale invasion, in the 2023 – 2025 academic years, the “Imago Anatomica” competition was resumed, and it became a vivid example of the combination of creativity and science in the learning process.

## MATERIALS AND METHODS

As a part of the «Imago Anatomica» competition, students had the opportunity to create individual or group crafts on anatomical topics. Forms of project implementation included: sculpting anatomical structures (using plastic materials to model organs and systems), embroidery depicting anatomical structures, drawing artistic interpretations, etc.

All participants received consulting support from a teacher-curator, which allowed them to integrate artistic vision with scientific reliability. The final stage was participation in the final of the competition, where the presentation and evaluation of works took place.

Research methods included: observation of the process of preparing crafts; their qualitative analysis, and questionnaire survey of participating students.

## RESULTS

The implementation of innovative methods of teaching anatomy at the Department of Morphology of the ARMI SSU made it possible to obtain a number of important educational, emotional, and communicative effects. These results are based on the observations of

teachers, student feedback, as well as an analysis of the dynamics of their involvement in the educational process.

The analysis of first- and second-year students' academic performance showed that despite being under martial law, the level of their academic activity has a positive dynamic. Despite the constant challenges, students show increased interest in the learning process and the desire to acquire knowledge, which indicates their high adaptability and resilience in the learning environment. 77,3% of students are visual and remember information better with the help of the organ of vision. That is why participation in a creative competition contributes in-depth study of the anatomical material, since creating a sculpture, drawing, or embroidery requires an accurate representation of anatomical structures, which increases concentration and attention to details. When creating their crafts, students study anatomical atlases and textbooks, consult with a teacher-curator, and model structures in accordance with morphological features.

During the 2023-2024 academic year, 25 students expressed their desire to participate in the «Imago Anatomica» competition by registering via Google form. Participants' personal data were anonymized by assigning code names (for example, «Student 1», «Student 2»), which allowed maintaining confidentiality when analyzing and publishing the results of the competition. Anonymization was carried out in accordance with the principles of academic integrity and by taking into account the voluntary consent of the students to participate in the study. Despite the fact that not all works reached the final stage, each participant was surveyed (an example of a questionnaire is given in Table 1), which allowed us to assess the main trends and the impact of the creative approach on the assimilation of educational material.

According to the survey results, students chose different types of artistic work, among which drawing prevails. A detailed distribution of the number of participants and the corresponding percentages is given in Table 2. In particular, drawing was chosen by 80% of students. Sculpting, embroidery and mixed techniques - by 4% each, respectively. Other forms of art – by 8% (Figure 1).

Table 1 – «Imago Anatomica» contest participant questionnaire

<b>1. General information</b>	
First name	
Last name	
Group:	
Course:	
<b>2. Participation in the competition</b>	
What kind of art do you plan to present your work as?	+ Sculpting +Drawing + Embroidery + Mixed techniques +Other (specify):
A brief description of your creative idea:	
Have you participated in similar competitions before?	+ Yes + No
<b>3. Educational impact of the competition</b>	
How do you think art helps in the study of anatomy?	+ Facilitates learning of the material + Develops creative thinking + Helps to remember structures better + Stimulates interest in the subject + Other
What exactly motivated you to participate in the competition?	+ Interest in art + Desire to deepen knowledge of anatomy + Experience from previous competitions + Recommendations from teachers + Other (specify):
<b>4. Contact details</b>	

Analysis of the questionnaire responses showed that drawing became the most popular type of artistic activity among students – it was chosen by 80% of respondents. Such a choice indicates a high interest of future doctors in visual art, which, in turn, contributes to more effective memorization of anatomical structures and understanding of their spatial relationships. Sculpting, embroidery and mixed techniques (4% each) also received positive feedback, offering alternative, creative ways of learning the educational material and activating the cognitive activity of students.

Table 2 – Students' choice of artistic techniques during the «Imago Anatomica» competition

Type of art	Number of students	Percentage of students (%)
Drawing	20	80%
Sculpture	1	4%
Embroidery	1	4%
Mixed media	1	4%
Other art forms	2	8%

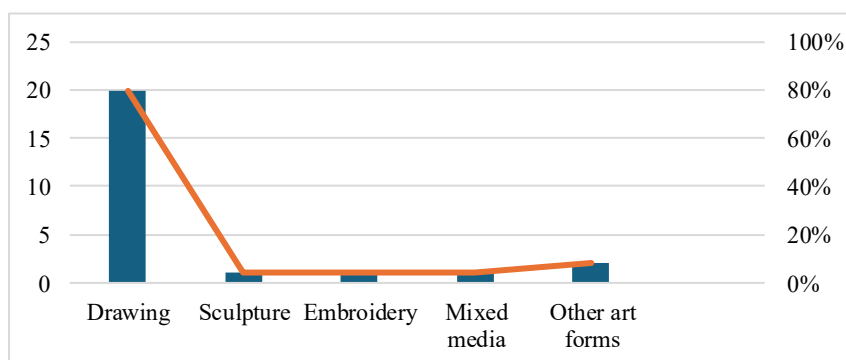


Figure 1. Artistic techniques chosen by students to participate in the «Imago Anatomica» competition

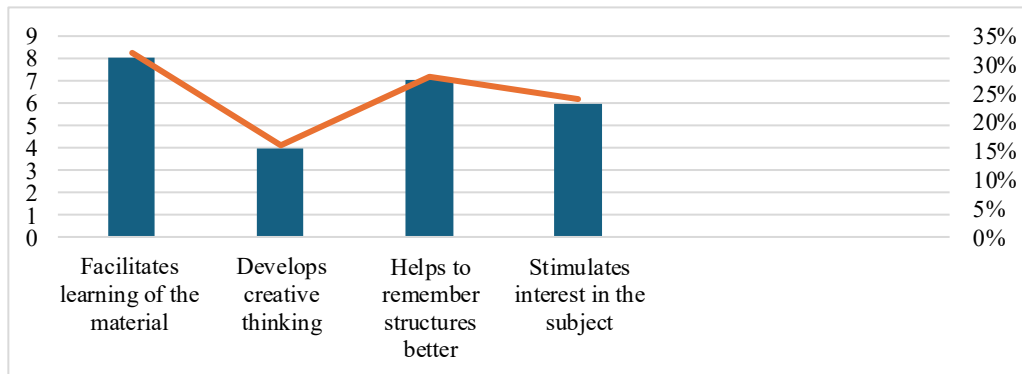
Interest in other forms of art (8%) demonstrates students' desire for non-standard self-expression, indicating an individualized, creative approach to the process of studying the subject. Further analysis of these responses may provide the basis for developing

innovative teaching methods that harmoniously combine artistic practices with traditional academic ones.

The survey of participants demonstrated that art significantly influences the quality of learning and contributes to the development of new educational

practices, namely: 1) it facilitates the acquisition of material – a considerable proportion of respondents noted that working with anatomical sculptures, drawings, and embroidery helps them to better understand the structures of the body; 2) it fosters creative thinking – a number of students indicated that combining science with art enables them to adopt non-

standard approaches to studying and analyzing material; 3) for 28% of participants, visualization aids in remembering complex anatomical objects and their relationships; 4) it stimulates interest in the subject – more than half of the students reported that the creative teaching format made the learning process more engaging and motivating (Fig. 2). The most frequently



**Figure 2.** The impact of the «Imago Anatomica» competition on the educational process of students

cited benefit was improved mastery of the material (32%), which confirms the effectiveness of visual and practical approaches in teaching complex medical disciplines. Nearly one-third of participants emphasized that visualization through art supports the retention of anatomical objects and their interconnections, thereby confirming that imaginative thinking is a powerful tool for the formation of long-term memory. Sixteen percent of students stated that the competition fostered creative thinking. Although this is the lowest indicator, it nonetheless demonstrates that the integration of science and art encourages the search for innovative solutions and the development of creative thought. All numerical data are presented in Table 3.

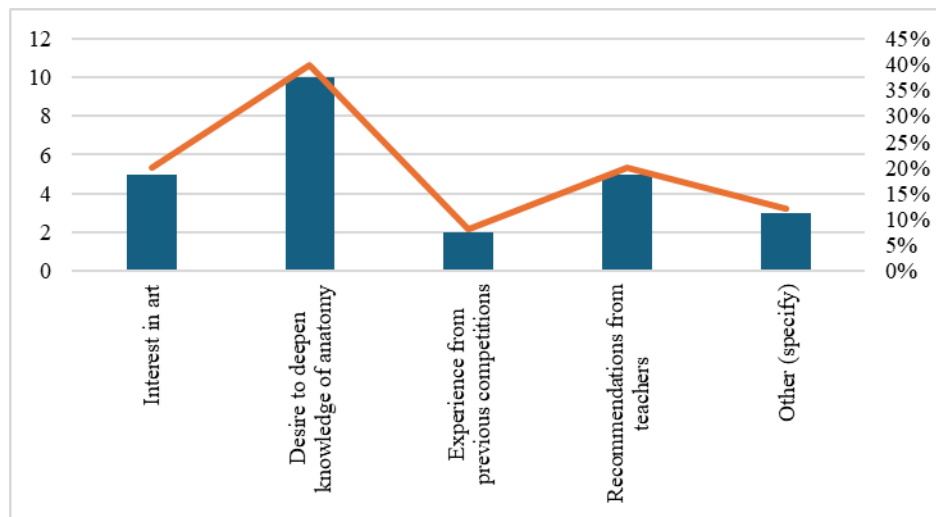
**Table 3 – Educational impact of the «Imago Anatomica» art competition**

<i>Educational impact</i>	<i>Number of students</i>	<i>Percentage of students (%)</i>
Facilitates learning of the material	8	32%
Develops creative thinking	4	16%
Helps to remember structures better	7	28%
Stimulates interest in the subject	6	24%

In response to the question, «What exactly motivated students to participate in the competition?», the following answers were provided: 1) interest in art – every fifth

student expressed an interest in creative teaching methods and their connection with science; 2) the desire to deepen knowledge of anatomy – nearly half of the participants viewed the competition as an opportunity to gain a better understanding of the subject; 3) prior experience in competitions – two students had previously taken part in art or science competitions; 4) recommendations from teachers – a fifth of the students reported participating on the advice of teachers, who regarded this format as offering new educational prospects; 5) other factors – 12% of students cited individual motivations such as the desire to try something new, gain practical experience, or join a community of like-minded peers (Fig. 3). The dominant motivation was the aspiration to achieve a deeper mastery of anatomy (40%), which outweighed purely aesthetic interest (20%). Teacher recommendations (20%) also played a significant role in encouraging participation. All data are summarized in Table 4.

In the 2023/2024 academic year, the special emphasis was on the depiction of areas of the body that are difficult to visualize. Thus, at the teachers' initiative, students were involved in making an anatomical sculpture of the muscles of the pelvic girdle, in particular the piriformis, obturator external and internal, and gemelli muscles, which form deep layers. These muscles are practically not visualized on the surface of the body, but they play a key role in maintaining posture, walking, and stabilizing the trunk. The work on this task required special attention to the spatial organization of muscle fibers, their arrangement, and functional characteristics (Fig.4).



**Figure 3.** Motivational factors for student participation in the «Imago Anatomica» competition

Another important project was the modeling of the arterial network of the knee joint. The students worked with a real knee joint preparation. On its basis, they recreated arterial anastomoses in the joint area, using improvised materials (threads, wire, plastic elements). Such a practical reconstruction allowed not only to better understand the topography of the vessels, but also to develop skills in spatial thinking, critical analysis, and clinical integration of knowledge (Fig.5).

**Table 4 – Reasons for students' participation in the «Imago Anatomica» competition**

<i>Motivational factor</i>	<i>Number of students</i>	<i>Percentage of students (%)</i>
Interest in art	5	20%
Desire to deepen knowledge of anatomy	10	40%
Experience from previous competitions	2	8%
Recommendations from teachers	5	20%
Other (specify)	3	12%

Special attention should be paid to the work «Tree of life» – an anatomical sculpture depicting the larynx in combination with flowers. This project combined the precise three-dimensional modeling of the larynx preparation with a metaphorical symbol of life-giving force – flowers sprouting from tissues. Such an interpretation not only requires a deep knowledge of the anatomy of the vocal apparatus, but also reflects a philosophical understanding of the role of breathing, voice, and life in general. The sculpture has become a kind of emblem of this year's competition, embodying a combination of science, art, and inner meaning (Fig.6).

Such multi-channel perception of information (visual, tactile, emotional) contributes to the activation of long-term memory. The results of the study show that students better learn the anatomical structures they work with during competitive tasks. The acquired knowledge is characterized by greater stability due to practical application and the involvement of visual-figurative components in the educational process. Moreover, working with poorly visualized structures contributes to the formation of a deeper understanding of anatomy «from the inside», which is of great importance for future clinical practice.

Due to the possibility of choosing materials and methods of making crafts, students demonstrate an individual creative approach. Some of them implement ideas through modeling from clay or polymer material, others – through embroidery with threads or beads. Some students choose graphics, painting or mixed techniques. Creativity is demonstrated not only in artistic design, but also in the meaningful content of the works: symbolism, color solutions, philosophical subtexts.

Particular attention was drawn to those works in which students combined drawing with embroidery, using mixed techniques to convey complex ideas and textures. This approach allowed us to enhance the aesthetic perception of the anatomical image and emphasize its vital, emotional, and cultural significance.

The works feature images of the heart, brain, female reproductive organs, musculoskeletal system, etc. These images combine the accuracy of anatomical depiction with symbolic interpretation. For example, a heart framed by a strange insect, or a skull students look at, identifies the importance and at the same time the complexity of obtaining medical knowledge.



**Figure 4.** Anatomical sculpture of the muscles of the pelvic girdle. Author – Student 1



**Figure 5.** «Arterial network of the knee joint» – anatomical model with a real specimen. Author – Student 2



**Figure 6.** Sculpture «Tree of life» – larynx with decoration. Author – Student 3

Often, the anatomical structure in student works «comes to life» – moves, interacts with the environment, and is combined with elements of nature, water, music, or art.

In the 2023/2024 academic year, a significant number of interesting crafts were presented:

Student 4 – drawing «The heart of life: dance of an enchanted beetle» (Fig. 7): a vivid example of the synthesis of symbolism and anatomy, where the heart is depicted as the center of emotional and physical existence, surrounded by moving lines in the form of beetles – an image of life in motion.

Student 5 – «Hand. The theme is the sea»: the anatomical image of the hand is organically combined with images of waves, symbolizing movement, inspiration and depth.

Student 6 – «Balance with nature»: the graphic work with a hint of harmony between the human body and the natural environment.

Student 7 – «Anatomy of the female body»: anatomical aesthetics through the prism of female strength, plasticity, and naturalness.

Student 8 – «Fetal circulation»: a work that symbolizes the beginning of life, where blood vessels intertwine with the image of motherhood.

Student 9 – «Granite of science»: the image of the brain in the interpretation of firmness, knowledge and endurance.

Student 10 – drawing with embroidery elements «Arterial flow of life»: a striking example of mixed technique, where red embroidered vessels emphasize the rhythm and force of blood circulation, adding volume and a sense of pulsation to the work.

These works demonstrate not only a deep knowledge of anatomy, but also the students' ability to re-understand them through the prism of a personal and artistic worldview, which is extremely valuable for the formation of a humanistic medical consciousness.



**Figure 7.** Pictures: 1. «The heart of life: dance of an enchanted beetle». Author – Student 4. 2. «Hand. The theme is the sea». Author – Student 5. 3. «Fetal circulation». Author – Student 8. 4. «Anatomy of the female body». Author – Student 7. 5. «Balance with nature» - Author – Student 6. 6. «Granite of science». Author – Student 9. 7. Drawing with embroidery elements «Arterial flow of life». Author – Student 10

After the full-scale invasion began in 2022, students, as well as teachers, faced serious educational challenges that required adaptation of the educational process. Holding a creative competition in the 2023 – 2024 academic years became an important means of supporting academic motivation, creating a favorable educational environment, and engaging students in active learning activities.

During the preparation of the competition works, students noted that they felt an emotional release during sculpting, embroidery or drawing. They also could concentrate on the positive result, which distracted them from the disturbing news. Moreover, they received support through communication with the mentor, which reduced the feeling of isolation.

Before the full-scale invasion, many foreign students studied at the ARMI SSU. They were a significant part of the academic community. In 2020 – 2021, teachers and students faced new challenges associated with the Covid-19 pandemic, namely, distance learning, decreased motivation, and emotional exhaustion. At the

same time, it was during this period that creative initiatives, in particular the «Imago Anatomica» competition, became a powerful tool for adapting to new conditions. The competition contributed not only to the maintaining of educational activity, but also to the creation of a space for self-expression, emotional support and the formation of a community of like-minded people. This was important for both students and teachers, who found it easier to overcome stress and feelings of isolation.

The active participation of foreign students became especially valuable. Their interest in intercultural exchange, in studying anatomy through creativity, as well as the desire to interact with Ukrainian colleagues contributed to the establishment of intercultural dialogue and integration into the academic environment. Even in difficult circumstances, high-quality communication and a creative approach to learning helped to maintain an atmosphere of involvement, mutual respect, and academic openness.

The «Imago Anatomica» competition creates an emotionally positive learning environment that takes anatomy beyond the textbook and demonstrates its connection with life, art and culture. This contributes to: strengthening interest in the subject, developing interpersonal communication, and the desire to develop and participate in similar initiatives in the future.

Such activities contribute to the development of communicative competence, which is an extremely important element of the professional training of a future doctor.

The success of the competition largely depended on the active participation of teachers, who not only provided support for students, but also acted as mentors, art teachers, critics and partners in the creative process. This level of involvement increases trust between students and teachers and contributes to the improvement of the educational climate at the department.

#### **DISCUSSION**

Using art as a method of teaching anatomy is a powerful tool that combines aesthetic perception, motor skills, and cognitive activity [2]. The «Imago Anatomica» competition confirmed the effectiveness of this approach, especially in conditions where traditional teaching is complicated by external factors.

An additional positive aspect was the emotional cohesion of the student community, as well as deeper interpersonal interaction between the teachers and students. Similar practices are already being actively implemented in leading medical universities worldwide, which indicates the relevance of the innovative direction [3].

The results of the implementation of creative teaching methods at the Department of Morphology of the ARMI SSU confirm the effectiveness of the interdisciplinary approach in medical education. The use of sculpting, drawing, embroidery and other artistic means not only diversifies the educational process, but also opens up new cognitive opportunities for the assimilation of complex morphological information [4, 5]. Combining art with professional training, according to Douglas et al. (2022), increases self-awareness and promotes mindfulness [6].

In particular, Rana et al. (2020) found that students who engage in artistic image analysis demonstrate better visual diagnostic skills [7]. Similarly, the results of the «Imago Anatomica» competition showed that students have a deeper understanding of topographic anatomy and are better able to navigate spatial relationships between structures.

In addition, the emotional component is no less important. As Maatman et al. [8,9,10], point out, creativity in the educational process helps to reduce

anxiety, increases the level of satisfaction with learning, forms a positive attitude towards the subject and prevents emotional burnout. This is especially relevant in war conditions, when the educational environment must be not only intellectually effective, but also psycho-emotionally supportive.

The competition also fostered student cohesion, particularly through teamwork, intergroup interaction, and mentoring support from faculty. This factor is crucial for the development of future physicians' professional identities and is consistent with Tzachrista et al. (2023)'s view that faculty encouragement of student creativity will lead to significant academic achievement. [11].

A considerable advantage of the competition was the possibility of integrating foreign students into the educational environment, which corresponds to world practices of internationalization of education [12,13]. Through joint creative activities, barriers between cultures are reduced, and the academic community becomes more open, inclusive, and cohesive.

Thus, the results of the study are consistent with the provisions of modern pedagogical science on the effectiveness of integrative, emotionally rich and personally oriented learning [2,3,6,11]. Further study of the effect of such approaches may be useful for the formation of a universal module of medical education that combines art and science.

#### **CONCLUSIONS**

The «Imago Anatomica» competition showed that a creative approach motivates students to active learning. Visualization, analysis of details and practical reproduction of anatomical structures helped participants to understand the subject more deeply. It is also important that the competition created a comfortable learning environment that contributed to the development of communication between students and the integration of foreign participants into the educational process. The «Imago Anatomica» competition is an effective educational platform that combines art and medical science, creating a unique space for the development of cognitive, emotional and creative competencies of students. Involvement in the creative process allows future doctors not only to more deeply understand complex anatomical structures, but also to rethink their meaning in the context of life, symbolism and aesthetics of the human body. Such a combination of artistic and scientific approaches contributes to the formation of stable cognitive connections, which has a positive effect on student success and the quality of mastering the educational material.

The role of the competition is especially important in conditions of social instability caused by a pandemic

and war. Creativity acts as a source for psychological stabilization, a way of self-expression and restoration of internal balance for students. Participation in «Imago Anatomica» also stimulates interpersonal interaction, teamwork and emotional cohesion of the academic community, which is crucial for the formation of a future medical professional.

The students creative works, which have already been created within the framework of the competition and which, we hope, will continue to be replenished with new ideas, impressions and creative approaches, are available for viewing online. The collection of artistic and scientifically oriented works, which unites both foreign and Ukrainian students, can be viewed at the link <https://drive.google.com/drive/folders/1s-cOK08VfURPPOUV264wKfCYo2Gkocm5?usp=sharing>.

The holding of the «Imago anatomica» competition vividly illustrates its significant potential as a means of intercultural integration, in particular through the active participation of foreign students. The initiative has all the prerequisites for scaling up to the national and international levels. Further development of the forms and methods of conducting the competition will contribute not only to improving the quality of medical education, but also to the formation of emotional intelligence, artistic thinking and creativity in medical students, preparing them for professional activity in a world that increasingly requires not only deep knowledge, but also sensitivity, imagination and humanistic values.

### PROSPECTS FOR FUTURE RESEARCH

In the future, it is advisable to conduct a systematic analysis of the level of material acquisition by students participating in creative competitions, compared to those studying using traditional methods. An important area of research is the assessment of the effectiveness of artistic practices in the development of professional competencies, the formation of learning motivation, and adaptation to the educational environment.

### AUTHOR CONTRIBUTIONS

1. Teslyk T.P. – significant contribution to the conception and construction of the manuscript; acquisition, analysis of data for the manuscript; drafting of the manuscript; agreement to take responsibility for all aspects of the work, ensuring proper investigation and resolution of issues related to the accuracy or integrity of any part of the work; final approval of the version to be published.

2. Yarmolenko O.S. – obtaining and interpreting data for the manuscript; critically reviewing the important intellectual content of the manuscript; agreeing to take responsibility for all aspects of the work, ensuring that questions related to the accuracy or integrity of any part of the work are properly investigated and resolved; and final approval of the version to be published.

3. Bumeister V.I. – final approval of the version to be published; critical review of the important intellectual content of the manuscript; agreement to take responsibility for all aspects of the work, ensuring that issues related to the accuracy or integrity of any part of the work are properly investigated and resolved; final approval of the version to be published.

4. Riabenko T.V. – critical review of the important intellectual content of the manuscript; agreement to take responsibility for all aspects of the work, ensuring that issues related to the accuracy or integrity of any part of the work are properly addressed; final approval of the version to be published.

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### CONFLICT OF INTEREST

The authors declare no conflict of interest.

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