IMPLEMENTING INTERDISCIPLINARY METHODS IN THE EDUCATIONAL FRAMEWORK

APLICAÇÃO DE MÉTODOS INTERDISCIPLINARES NO QUADRO EDUCATIVO

Olena Sukhomlynova
ORCID 0000-0001-7592-7255

Department of Mathematics and Physics, Kruty Heroes Military Institute of Telecommunications and Information Technology
Kyiv, Ukraine
osukhomlynova@gmail.com

Tetiana Lysenko
ORCID 0000-0002-7700-9332

Department of Analytical, Physical and Colloid Chemistry, Pharmaceutical Faculty
Bogomolets National Medical University
Kyiv, Ukraine
t.lysenko@nmu.ua

Olha Rembach
ORCID 0000-0003-0595-1502

Department of Linguistics, Faculty of Management and Economics, Leonid Uzkov Khmelnytskyi University of Management and Law
Khmelnytskyi, Ukraine
olga.ukr@ukr.net

Viktoriia Pavelko
ORCID 0000-0002-6372-6090

Department of Pedagogy, Preschool and Primary Education, Faculty of Preschool and Primary Education, History and Arts, Kremenets Taras Shevchenko Regional Academy of Humanities and Pedagogy
Kremenets, Ukraine
vpavelko@ukr.net

Yurii Kovalchuk

Department of Agroengineering, Faculty of Engineering and Technology
Uman National University of Horticulture
Uman, Ukraine
temp14053@gmail.com

Abstract. The article aims to study the principles and ways of implementing the interdisciplinary approach into the educational process. The research is based on empirical experience in teaching at higher education institutions, an analysis of educational programmes of higher educational institutions in Ukraine, a survey of medical university lecturers, as well as a pedagogical experiment on the effectiveness of the interdisciplinary approach conducted at Ivano-Frankivsk National Medical University among second-year students of the Dentistry programme. The control group studied two separate subjects, "Foreign (English) Language for Professional Purposes" and "Social Medicine, Public Health, and the Fundamentals of Evidence-Based Medicine", while the experimental group took an integrated course, Module 1, which combined these two subjects in the form of binary lessons. The integrated course had the most significant impact on forming sufficient and high levels of knowledge, with a difference of 9% and 7%, respectively, between the control and experimental groups. Additionally, the experimental group had 10% fewer students with low-developed skills and abilities. The experiment data confirm the considerable effectiveness of integrated courses, suggesting that universities should actively introduce them into the educational process. The authors propose the following ways to implement the interdisciplinary approach: inclusion of interdisciplinary topics in lectures; conducting binary lectures; integrating common cases into seminar and practical disciplines to solve interdisciplinary practical tasks and other modern educational technologies of problem-based learning; developing interdisciplinary courses for elective and optional subjects; preparing articles and conference presentations with two or more co-authors from related fields of knowledge. Based on the empirical method, it was established that the effectiveness of applying the interdisciplinary approach in higher education is associated with the systematisation and structuring of acquired specialised knowledge, stimulation of student motivation, and scientific inquiry.

Keywords: discipline integration; higher education institution; scientific inquiry; educational process; binary lecture

Resumo. O artigo tem como objetivo estudar os princípios e as formas de implementar a abordagem interdisciplinar no processo educativo. A investigação baseia-se na experiência empírica de ensino em instituições de ensino superior, numa análise dos programas educativos de instituições de ensino superior na Ucrânia, num inquérito a

professores universitários de medicina, bem como numa experiência pedagógica sobre a eficácia da abordagem interdisciplinar realizada na Universidade Nacional de Medicina de Ivano-Frankivsk entre estudantes do segundo ano do curso de Medicina Dentária. O grupo de controlo estudou duas disciplinas separadas, "Língua Estrangeira (Inglês) para Fins Profissionais" e "Medicina Social, Saúde Pública e os Fundamentos da Medicina Baseada em Evidências", enquanto o grupo experimental frequentou um curso integrado, o Módulo 1, que combinava estas duas disciplinas sob a forma de aulas binárias. O curso integrado teve o impacto mais significativo na formação de níveis de conhecimento suficientes e elevados, com uma diferença de 9% e 7%, respetivamente, entre os grupos de controlo e experimental. Além disso, o grupo experimental teve menos 10% de alunos com competências e capacidades pouco desenvolvidas. Os dados da experiência confirmam a eficácia considerável dos cursos integrados, sugerindo que as universidades devem introduzi-los ativamente no processo educativo. Os autores propõem as seguintes formas de implementar a abordagem interdisciplinar: inclusão de tópicos interdisciplinares em palestras; realização de palestras binárias; integração de casos comuns em seminários e disciplinas práticas para resolver tarefas práticas interdisciplinares e outras tecnologias educativas modernas de aprendizagem baseada em problemas; desenvolvimento de cursos interdisciplinares para disciplinas electivas e opcionais; preparação de artigos e apresentações em conferências com dois ou mais co-autores de áreas de conhecimento relacionadas. Com base no método empírico, foi estabelecido que a eficácia da aplicação da abordagem interdisciplinar no ensino superior está associada à sistematização e estruturação dos conhecimentos especializados adquiridos, ao estímulo da motivação dos estudantes e à investigação científica.

Palavras-chave: integração de disciplinas; instituição de ensino superior; investigação científica; processo educativo; aula binária

1. INTRODUCTION

In the modern educational system, the issue of an interdisciplinary approach to organising the educational process at various educational institutions has gained momentum over the past few decades. Among the possible mechanisms for overcoming challenges, the promotion and expansion of innovation programmes, interdisciplinarity, and transdisciplinarity with a long-term orientation towards socio-cultural goals and needs have been mentioned. Most educational programmes include sections on cross-subject links and also emphasise the importance of constructing (and therefore implementing) an individual educational trajectory during the mastering of the primary educational programme within the framework of the development programme for universal educational actions, which includes the completion of project activities (Kessel et al., 2008).

Interdisciplinary integration is the mutual complementing of the content of various academic disciplines through the use of different innovative methods, tools, and organisational forms of learning. In psychology and pedagogy, it has been substantiated that interdisciplinary integration is one of the essential psychological-pedagogical conditions, and the principle of interdisciplinarity has recently become one of the leading didactic-methodological principles (Barry et al., 2008). There are no universally perfect model recommendations and practices for implementing interdisciplinary research; they are synthesised at the level of educational institution management or individual faculties, which aim to train specialists in a particular field by promoting and developing horizontal inter-institutional and interdepartmental connections (including international ones), as well as by developing new academic research programmes and structures. It is worth differentiating between different types of discipline integration. Thus, interdisciplinarity is understood by scholars as the interaction between two or more different disciplines (Barry & Born, 2013), multidisciplinarity as the combination of different disciplines that do not have obvious substantive connections, such as music and mathematics, pluridisciplinarity as the combination of disciplines with certain substantive similarities (for example, Latin, French, and Greek), and transdisciplinarity (Stokols et al., 2023) as the creation of a standard system of axioms for a particular set (block) of disciplines.

We fully recognise that the goal of higher education today is to develop a specialist capable of operating methods and tools from various disciplines, which forms the foundation for the possibility and success of multi- and interdisciplinary research. The role of university

educational policy is to create a new academic culture and break down outdated stereotypes (Mäkinen, 2018). At the same time, we emphasise that this is not abstract future forecasting but the continuation of existing trends in education, linked to ongoing research in different disciplines, with the constantly changing parameters of demand, market, and the objective needs of society, which defines the relevance of our study.

The aim of this article is to explore the principles and ways of integrating an interdisciplinary approach into the educational process.

The authors of this article set the following research tasks, which were addressed in the analysis process:

- Outline the essence of the interdisciplinary approach in the educational process;
- Describe the main ways of integrating the interdisciplinary approach into the educational process;
- Identify the key benefits that the interdisciplinary approach will provide to students in achieving educational qualifications;
- Analyse the results of a survey of lecturers in higher educational institutions in Ukraine regarding the effectiveness of applying the interdisciplinary approach.

The authors' personal contribution to the development of the interdisciplinary theme lies in their pioneering examination of the combination of the disciplines "Social Medicine" and "Foreign Language for Professional Purposes" within a single integrated course. They developed a thematic plan for such sessions, justified the feasibility of conducting binary practical sessions, and demonstrated the effectiveness of such interdisciplinary integration through a pedagogical experiment.

2. LITERATURE REVIEW

The interdisciplinary approach can significantly influence the resolution of contemporary educational problems and help mitigate educational losses, especially during crisis periods, which some countries are experiencing today (Tsybuliak et al., 2023). Every discipline has its object of study and tools, and in many fields of knowledge, these overlap and are interconnected, making the interdisciplinary approach particularly relevant (Lam et al., 2014). It is essential to consider the accumulation of informational and historical knowledge bases. Mastering this comprehensively is impossible, so identifying key common elements across disciplines enables both learners and researchers to acquire and apply the knowledge base while minimising time expenditure (Sameshima et al., 2019).

Mansilla et al. (2016) applied interdisciplinarity when describing the theory of cognitive development. Researchers such as Nicolescu (2010, 2014) and Pohl et al. (2021) developed the methodology for a transdisciplinary approach. Researchers Manisha Patel and Dipti P. Bhatt (2024) explored the role of the interdisciplinary approach in school education, while scholars like Stokols et al. (2008) and Sanchez-Carrillo et al. (2021) examined the role of the interdisciplinary approach in higher education systems. The integration of disciplines in medical education has been studied by scholars like Ratna (2019), Riera et al. (2023).

Mansilla (2006a, 2006b) and Mansilla and Learning (2017) identified three epistemological criteria for evaluating interdisciplinary work: the extent to which new ideas are connected with prior disciplinary knowledge in various engaged disciplines, the reasonable balance achieved in combining disciplinary perspectives, and the effectiveness with which the integration of disciplines contributes to understanding and exploration. These criteria can guide reviewers and evaluators of interdisciplinary research by drawing attention to some of the unique epistemic demands presented by this type of scholarly work (Sukhomlynova et al., 2024).

Researchers such as Corbacho et al. (2021) correctly note that despite the growing body of literature on interdisciplinary teaching experiences in higher education, there is still a general

lack of theoretical foundations. In their work, the researchers gathered and applied strategies from recognised academic fields such as social and organisational psychology, psychology of teaching and learning, and team science, paying particular attention to aspects known to motivate and maximise efforts to foster diverse perspectives and teamwork, thereby enriching educational programmes.

Scholars Stein et al. (2008) argue that specific philosophically designed quality control parameters should guide approaches to interdisciplinary education, emphasising that interdisciplinary curricula must respect students' intellect and the complexity of the subject matter.

Birsel et al. (2023) focus their academic attention on understanding the interactions between art, science, and technology as forms of broad interdisciplinary or transdisciplinary collaboration. The ecology of collaboration involves a complex set of social structures ranging from autonomous, individually organised teams to institutional programmes. By using a socio-ecological approach, integrating social, organisational, and cultural factors, artistic, scientific, and technological collaboration (AST), according to the researchers, can form a conceptual foundation for collaboration between art and science, detailing AST in its connection to knowledge, aesthetics, interdependence, and experimentalism.

As the literature review shows, the methods of implementing the interdisciplinary approach have not been studied sufficiently, which highlights the relevance of our research.

3. RESEARCH METHODS

The following methods were used in the course of the study:

- The method of analysis and synthesis was used for conducting a critical review of scientific literature and the level of research on the issue in the global context, as well as for analysing the results of the survey;
- The descriptive method was employed to describe the ways and methods of implementing the interdisciplinary approach;
- The empirical method (survey) was applied when conducting a survey among higher education lecturers in medical institutions regarding the effectiveness of implementing the interdisciplinary approach. For this purpose, a survey was conducted with 96 academic staff members from the theoretical and practical departments of Ivano-Frankivsk National Medical University to determine the frequency of using the interdisciplinary approach in the educational process. The survey was carried out during the 2023–2024 academic year. The age range of the respondents was 28–56 years;
- A pedagogical experiment was conducted to study the effectiveness of using the interdisciplinary approach in teaching. The pedagogical experiment was carried out at Ivano-Frankivsk National Medical University in the second semester of the 2023–2024 academic year during the teaching of an integrated course in social medicine and professional English to second-year dental students;
- The generalisation method was used to formulate the scientific and theoretical conclusions of the study;
- Statistical research methods used in processing the results of the survey and deriving the results of the ascertaining and formative stages of the pedagogical experiment.

4. RESULTS

Implementing this approach is critical in medical educational institutions, as it allows the student to orient themselves in selecting a narrow specialisation and realise their area of responsibility in the complex healthcare system. Regarding the next stage of education (for example, from undergraduate to master's degree and, generally, to future life), such a tool for

optimising education as the interdisciplinary approach serves as a kind of propedeutics, increasing educational progress. It is also essential in project activities to include both natural and humanitarian disciplines, including artistic ones. In this case, the educational route is realised through academic activities and educational work.

The difficulty in implementing the interdisciplinary approach is primarily associated with the lack of lecturers in universities who simultaneously have deep knowledge in several disciplines. In medical universities, lecturers of humanitarian disciplines generally do not have a medical education, and lecturers of clinical disciplines, lacking specialised pedagogical education, are often not well-versed in teaching methodology. This, in turn, hinders the comprehensive application of acquired knowledge in solving various professional tasks in the future careers of medical university graduates. To implement interdisciplinary integration, lecturers of theoretical, humanitarian, and specialised disciplines must familiarise themselves with the contents of the biology and anatomy programmes, just as the biology and anatomy lecturer must not only be familiar with the programme (or the part of the programme directly related to their subject) in Latin but also with the programmes of humanitarian and specialised disciplines. Only in this case will the process of interdisciplinary integration be conscious, productive, and purposeful. All lecturers must work in the same direction when developing curricula, but the educational material should not be duplicated across different subjects.

Interdisciplinary integration in a medical university is a process of interaction, penetration, and complementing the content components of the studied disciplines. It is realised by involving each discipline in forming a holistic picture and using information from one discipline to explain and demonstrate the phenomena and laws of another discipline. Teaching based on interdisciplinary integration presents particular demands on teaching methods, and the lecturer must adopt a creative approach, using various methods and forms of teaching to form the integrity and systematic nature of students' knowledge.

One of the simplest forms of integration is integrated educational sessions, scientific projects, lectures, seminars, practical works, reports, and article writing. It is important that practical research also be interdisciplinary. Conference presentations add extra points to the student's academic ranking, and interdisciplinary integration creates conditions for students to form a holistic worldview. A student who has mastered knowledge on an interdisciplinary basis has the foundation for conducting further scientific research, as interdisciplinarity is now one of the fundamental elements of educational content.

Implementing the interdisciplinary approach in a medical educational institution occurs in several stages, each involving students from different faculties. The lecturer forms groups that differentially examine the patient: students of the paediatric faculty apply clinical methods, students of the faculty of clinical psychology conduct experimental-psychological and neuropsychological research, social-psychological training (development of resilience to stress, cognitive and social neurocognitive deficit at admission and discharge, neurocognitive training, participate in a psycho-educational programme for patients, consult the patients' families). Student participants in this step-by-step process are assigned tasks in advance, depending on the specifics of the discipline being studied. For example, students studying the cycle “Practicum in Pathopsychology” need to conduct a psychodiagnostic study of the cognitive sphere (investigate the patient's attention, memory, and thinking) and emotional-personality characteristics of the patient; when studying “Neuropsychology”, students must conclude the state of the patient's higher cortical functions, the presence of symptoms of local brain damage. During conferences, results prepared by different specialists are discussed. Thus, a comprehensive approach is implemented in each specific clinical case, which is crucial for differential diagnosis, optimisation of drug therapy, and, above all, providing more appropriate care to the patient. Multidisciplinary patient examination by various specialists allows for a higher-quality approach to differential diagnosis and competent development of a medical and

social rehabilitation programme. The multidisciplinary approach motivates medical students in their educational activities and fosters their self-regulation, as involvement in natural multi-professional practical environments influences the formation of professional motivation.

Thanks to the implementation of the interdisciplinary approach, students can choose the boundaries of expanding or reducing the volume of material on a specific project, which allows for the realisation of their educational trajectory in several ways:

1. in a group (of different composition, both in quantity and quality, i.e., by functions, roles),
2. individually (once or with prolongation, for example, over a year or several years).

This intensive interaction process, participation in the internal processes of the professional community, and multidisciplinary study of the patient contribute to the formation of general cultural and professional competences but also to the personal growth of students. It cannot be categorically stated that this is the only factor influencing the formation of high self-regulation and motivation. For young professionals in training, working in a multi-professional community is an excellent opportunity to gain knowledge from disciplines and develop practical professional communication skills. This form teaches students to interact and integrate with future specialists from various fields. The interdisciplinary approach in education involves using methods, factual data, theories, and practices from different scientific disciplines. The following are proposed ways of implementing the interdisciplinary approach in the organisation of the educational process at HEIs:

1. inclusion of interdisciplinary topics in the lecture course;
2. organisation and delivery of binary lectures, including those in English;
3. organisation and delivery of guest lectures;
4. inviting practitioners with significant professional achievements to practical classes;
5. incorporating common cases into seminars and practical disciplines for solving interdisciplinary practical tasks and other modern educational technologies of problem-based learning;
6. developing interdisciplinary courses for elective disciplines;
7. preparation of articles and conference presentations with the participation of two or more co-authors from related fields of knowledge.

To study the practice of using the interdisciplinary approach in education, a survey of 96 academic staff from theoretical and practical departments of Ivano-Frankivsk National Medical University was conducted to determine the frequency of using the interdisciplinary approach in the educational process. The survey was conducted during the 2023–2024 academic year. The age range of the respondents was 28–56 years. In response to the question, “How often do you apply the interdisciplinary approach in your teaching practice?” the answers were distributed as follows (Figure 1):

As seen from the diagram, without exception, all the lecturers at the medical university apply an interdisciplinary approach in their practice, with the absolute majority (67%) using this approach frequently, 13% consistently, and 20% rarely.

The survey also addressed the effectiveness of interdisciplinary integration. Academic staff experts could select several response options, and the ranking results are presented in a table (Table 1).

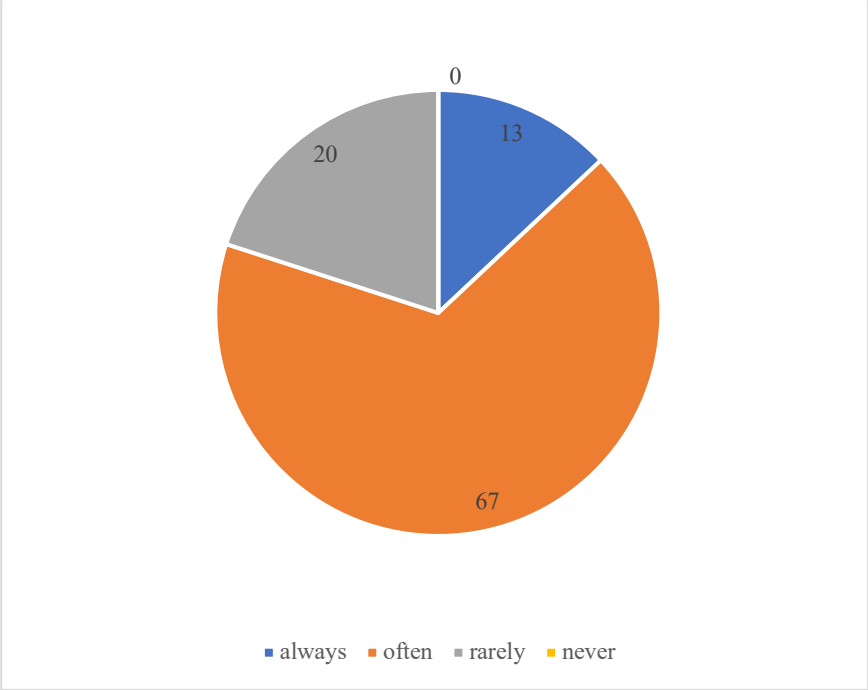

Figure 1. Results of Answering the Question "How often do you use an interdisciplinary approach in your teaching practice?"

Table 1. Ranking Results of the Interdisciplinary Approach

Rating place	The result of an interdisciplinary approach	Number of respondents who selected the option
1	Promotes systematisation and structuring of acquired knowledge	66
2	Stimulates student motivation to study the discipline	51
3	Encourages students to conduct their research	38
4	Expands the general outlook of the student	32
5	Improves cognitive abilities	29
6	Deepens understanding of the specialisation of sciences	27
7	Promotes the interaction of related disciplines	17

As seen from the ranking table of the survey results, the effectiveness of applying an interdisciplinary approach in higher education is primarily related to the systematisation and structuring of acquired specialised knowledge, the stimulation of student motivation and research, and the broadening of general horizons. These response options lead among respondents who have implemented the studied approach in their teaching activities in higher medical schools, meaning their answers are based on personal experience.

During the research, a scientific hypothesis was put forward suggesting that integrative courses contribute to higher success in subjects, more fully developing core competences and programme outcomes. To prove the effectiveness of integrated courses, a pedagogical experiment was conducted, in which two groups were formed: a control group and an experimental group (15 participants in each group). The group selection was based on an approximately equal average achievement rate. The experiment was conducted among second-year dental students at the Ivano-Frankivsk National Medical University.

The pedagogical experiment to test the effectiveness of interdisciplinary integration was conducted in three stages. The first stage (the initial stage) was to examine the baseline and projected data, discuss the hypothesis with the teachers participating in the experiment, prepare the relevant educational and methodological materials, and assess the student's readiness to implement integrated learning.

The second stage of the experiment (the exploratory stage) aimed to develop the theoretical foundations of the research and methodological support and divide the students into control and experimental groups. The control group studied two separate subjects: “Foreign (English) Language for Professional Purposes” (16 hours of practical classes) and “Social Medicine, Public Health, and Fundamentals of Evidence-Based Medicine” (16 hours). The experimental group undertook an integrated course of Module 1, which combined the two disciplines in a binary lesson format, with the total number of practical classes doubled to 32 hours due to the integration of both subjects. The thematic similarity and the possibility of mutual enhancement of the disciplines formed the basis for their combination. The social medicine course instructor was also required to be proficient in English, as the course was taught in English.

The third stage of the experiment (the formative stage) aimed to implement the integrated course in practice, test the hypothesis, assess academic achievements, and interpret the results. Table 2 presents the thematic content of the integrated English-language course.

Table 2. Thematic Plan of the Integrated Course

The result of an interdisciplinary approach	Number of hours
The system of higher medical education in Ukraine	4
The system of higher medical education in the world	4
International healthcare organisations	4
Public health system in Ukraine	4
World practices of healthcare system organisation	4
Types of medical institutions	4
Evidence-based medicine in Ukraine: formation and development	4
Final module control (tests and oral part)	4

For the statistical justification of the absence of significant differences between the control and experimental groups in terms of academic achievements in physics from the previous academic year, the Pearson criterion ($\chi 2$) was used. Figure 2 presents the graph of the distribution of students according to their academic achievements in the control and experimental groups after the formative stage of the pedagogical experiment.

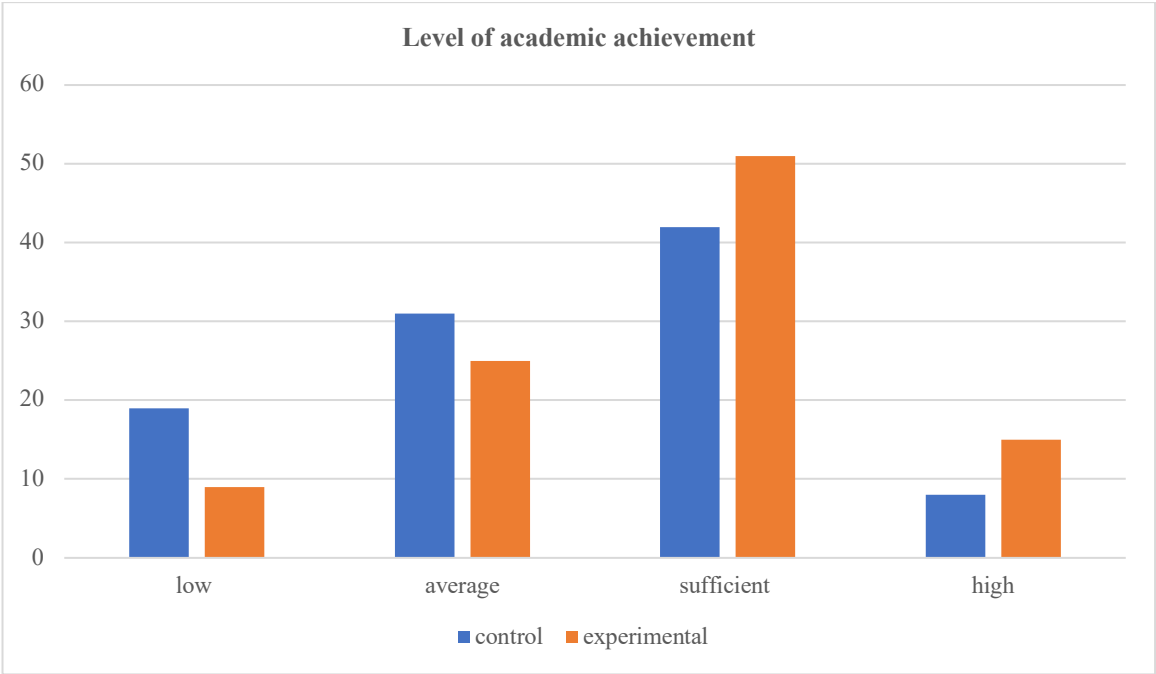

Figure 2. Level of Academic Achievement of the Control and Experimental Groups after the Formative Stage of the Experiment

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The assessment of academic achievements was conducted as a modular control, consisting of two parts: a test (80 questions, with 40 points being the maximum score) and an oral part (40 points being the maximum score). When evaluating the oral response, both the content of the answer and the student's English language competence were considered. As shown in the diagram, the integrated course had the most significant impact on developing sufficient and high levels of knowledge, where the difference between the control and experimental groups was 9% and 7%, respectively. Moreover, the experimental group had 10% fewer students with low skills and competences. The data from the experiment demonstrate a high level of effectiveness of integrated courses, so universities need to implement them in the educational process, especially in the preparation of students from medical institutions for the "KROK-1" exam, which includes 25% of English-language tests aimed at assessing the level of professional English language competence.

5. DISCUSSION

We share the position of the scholars Mäkinen et al. (2020) that the interdisciplinary approach faces several obstacles in its implementation. Firstly, it is essential to note the discrepancy in the conceptual apparatus, even in related disciplines, the differences in research algorithms and expertise, and the variation in terminology. Secondly, polysemy, which complicates the perception of the material, is often encountered in academic works. While within the development of a specific science, there is a tendency to establish its terminology, the interdisciplinary approach tends to reverse this by applying shared terminology. Therefore, expanding and comprehensively developing the conceptual apparatus while reworking it is necessary. Sometimes, this process even affects elements of basic terminology. For researchers conducting interdisciplinary studies, there should be no controversial interpretation of the same basic terms, although practitioners often use the conceptual apparatus without a critical approach (Honchar et al., 2021; Kryvoshein et al., 2022; Voropayeva et al., 2022). However, it should be noted that shared terminology still serves as a foundation for starting research or a prerequisite for mastering the material of a discipline.

We fully support the position of Huutoniemi et al. (2010) that the structuring of educational programmes should be based on the following principles:

- The accumulation of theoretical and practical bases from interdisciplinary courses should include elective disciplines;
- The assessment tools for interim certification, aimed at checking the level of general professional competences, should also take into account interdisciplinary connections;
- In the course of project-based or case-based learning, it is appropriate to include tasks that are interdisciplinary, professionally oriented, and require a comprehensive approach;

When forming the lecture topics of disciplines, in addition to the principle of problem-based learning, data from related disciplines should also be involved, including through such a form of material delivery as binary lectures.

6. CONCLUSION

Thus, based on the above, we can assert that interdisciplinary integration, creative collaboration between teachers of different disciplines to achieve the goals of the learning process, is one of the most critical factors in optimising the educational process in higher education institutions, including medical universities. Interdisciplinary integration is much

broader than interdisciplinary connections, as it involves purely technical, functional interaction and deep reflection, goal setting, and designing within the learning process.

It is appropriate to integrate an interdisciplinary approach into the educational process by including interdisciplinary topics in the lecture course; conducting joint lectures, incorporating common cases into seminars and practical disciplines to solve interdisciplinary practical tasks and other modern educational technologies of problem-based learning; developing interdisciplinary courses for elective subjects and extracurricular activities; preparing articles and conference presentations with two or more co-authors from related fields of knowledge.

The results of a survey of experts from among the teaching staff of Ivano-Frankivsk National Medical University showed that the effectiveness of applying an interdisciplinary approach in higher education is primarily associated with the systematisation and structuring of acquired specialised knowledge, stimulation of motivation, and students' scientific inquiry, as well as the expansion of general awareness.

The conducted pedagogical experiment on the integration of the subjects “Foreign (English) Language for Professional Purposes” and “Social Medicine, Public Health, and Fundamentals of Evidence-Based Medicine” showed that, firstly, the integrated course had the most positive effect on the formation of sufficient and high levels of knowledge, with the difference between the control and experimental groups being 9% and 7%, respectively. Secondly, the experimental group had 10% fewer students with a low level of developed skills.

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