Postgraduate Student, **IVAN PRYLEPA**
Oleksandr Dovzhenko Hlukhiv National Pedagogical University
Address: 24 Kyievo-Moskovska St., Hlukhiv, 41401, Ukraine
E-mail: ivan2400@ukr.net

CROSS-DISCIPLINARY APPROACH TO PROFESSIONAL TRAINING: INTERNATIONAL EXPERIENCE

ABSTRACT

The article considers the peculiarities of cross-disciplinary educational programs in various foreign educational institutions. Emphasis is placed on reforming the education system using a cross-disciplinary model of education in accordance with international standards and labor market requirements. The experience of implementing a cross-disciplinary approach in different specialties has been analyzed. Ways to equalize additional skills that are not provided by educational programs, using a cross-disciplinary approach have been outlined. The importance of using a cross-disciplinary approach as the main part of interdisciplinary studying has been emphasized. The necessity of using cross- disciplinary studying as an integral part of innovative educational techniques has been highlighted. Cross-disciplinarity is described as one of the main integrative teaching methods. Clear definitions of concepts of cross-disciplinarity, multidisciplinarity, and transdisciplinarity have been given. Cross-disciplinary approaches in educational programs at Brown University (Rhode Island, USA), Warren Alpert Medical School of Brown University (Rhode Island, USA), Vienna University of Applied Arts (Universität für angewandte Wunst Wienst), IT University of Copenhagen (Copenhagen, Denmark), Hong Kong University of Science and Technology (Guangzhou), Roberts Wesleyan College (Rochester, NY), Harvard Graduate School of Education (Cambridge, MA) have been analyzed. Special attention has been paid to the Scholarly Concentrations program; a long-term mentoring program based on cross-disciplinary approach that covers all four years of study at Alpert Medical School. It is an optional element of the curriculum that provides students with additional opportunities to develop the skills and abilities through research, scientific and extracurricular experience in one of the twelve areas of science concentration.

Keywords: *cross-disciplinarity, interdisciplinarity, cross-disciplinary programs, cross-disciplinary approach, cross-disciplinary training.*

АНОТАЦІЯ

У статті розглянуто особливості міждисциплінарних освітніх програм у різних зарубіжних навчальних закладах. Акцент зроблено на реформуванні системи освіти з використанням міждисциплінарної моделі освіти відповідно до міжнародних стандартів та вимог ринку праці. Проаналізовано досвід впровадження міждисциплінарного підходу за різними спеціальностями. Окреслено шляхи вирівнювання додаткових навичок, які не передбачені освітніми програмами, за допомогою міждисциплінарного підходу. Наголошено на важливості використання міждисциплінарного підходу як основної частини міждисциплінарного навчання. Висвітлено необхідність використання міждисциплінарного навчання як невід'ємної частини інноваційних освітніх технологій. Міждисциплінарність описується як один

з основних інтегративних методів навчання. Дано чіткі визначення понять міждисциплінарності, мультидисциплінарності і трансдисциплінарності. Проаналізовано міждисциплінарні підходи в освітніх програмах університету Брауна (*Род-Айленд, США*), Медичної школи Уоррена Альперта університету Брауна (*Род-Айленд, США*), Віденського університету прикладних мистецтв (*Universität für angewandte Wunst Wienst*), Технічного університету Копенгагена (*Копенгаген, Данія*), Гонконзького університету науки і техніки (*Гуанчжоу*), коледжа Робертса Весліана (*Рочестер, штат Нью-Йорк*), Гарвардської вищої школи освіти (*Кембридж, Массачусетс*). Особливу увагу було приділено програмі «Наукові концентрації» (*Scholarly Concentrations*) – довгостроковій програмі наставництва на основі міждисциплінарного підходу, яка охоплює всі чотири роки навчання в медичній школі Уоррена Альперта. Це факультативний елемент навчальної програми, який надає студентам додаткові можливості для розвитку вмінь та навичок шляхом дослідження, наукових розвідок та позакласної діяльності в одному з дванадцяти напрямів наукової концентрації.

Ключові слова: *міждисциплінарність, міждисциплінарні програми, міждисциплінарний підхід, міждисциплінарна підготовка, програма підготовки.*

INTRODUCTION

Processes related to globalization and digitalization are accompanied by changes in all areas of human life, which requires constant acquisition of new skills and competencies. This necessitates the need to introduce the latest models of education aimed at meeting personal needs and demands of the labor market.

State policy in Ukraine is aimed at reforming the education system in accordance with its international standards and labor market requirements. The Strategy for the Development of Higher Education in Ukraine for 2021–2031 (Strategy for the development of higher education in Ukraine for 2021–2031, 2020) focuses on:

− ensuring the quality and accessibility of higher education for different strata of the society;

− complying the content of educational programs with world trends;

− developing the system of state standards of higher education on the basis of qualification requirements;

− ensuring compliance of the content of higher education with the current and strategic goals of the country;

− updating the content of educational programs;

− strengthening interdisciplinary cooperation in educational programs.

The State Strategy for Regional Development for 2021–2027 emphasizes the need to introduce the latest educational approaches and formats with the enhanced applied nature and interdisciplinary approach related to intellectually capacious, productive and innovative types of entrepreneurships (State strategy of regional development for 2021–2027, 2020).

The education system must meet the trends and requirements of the labor market, and graduates of educational institutions must be its competitive participants (Kovalchuk, 2017; Kovalchuk, 2016).

THE AIM OF THE STUDY

The aim of the paper it to carry out a theoretical analysis of international experience in the implementation of cross-disciplinary educational programs in various educational institutions worldwide.

THEORETICAL BASIS AND RESEARCH METHODS

The issue of interdisciplinarity is not new in science. It has been studied for many years. In the scientific literature, the issue of interdisciplinary relations was studied by G. Bibik, O. Buhayova, J. Buzinskaya, L. Deminska, Y. Derkach, V. Fedorova, O. Hlobina, S. Honcharenko, V. Ilchenko, L. Kolomiets, L. Kovalchuk, I. Kozlovskaya, M. Kurach, N. Loshkaryova, O. Lyashenko, V. Maksymova, O. Mitryasova, L. Momot, D. Pokryshen, S. Rybak, N. Samaruk, P. Samoilenko, O. Serhyeyeva, G. Shatkovska, V. Shvets, Z. Slyepkan, N. Tararak, O. Teslenko, S. Tkachenko, Y. Tryus, A. Usova, T. Viychuk, O. Yefremova, N. Zakharova, M. Zhaldak, I. Zvyereva, and others).

L. Bentarlanffy, O. Bogdanov, G. Hacken, I. Prykhozhyn, and N. Wiener studied interdisciplinary approach in scientific cognition. O. Komar, V. Lukyanets emphasized epistemological role of interdisciplinarity. H. Mednikova highlights signs of creativity in interdisciplinary research, which, on the one hand, combines the knowledge gained in higher educational institutions, and on the other hand – knowledge that is directly needed in the workplace in a particular field.

The issue of interdisciplinarity is raised in the studies of V. Arshynov, A. Bekrenev, A. Bochan, V. Budanov, I. Dobronravov, A. Huriev, V. Kostyuk, K. Krechetnykov, L. Kyyashchenko, V. Mykhelkevych, D. Shyryayev, V. Styopin, L. Sydorenko, T. Tytovets, A. Verbytskyi. Interdisciplinary relationships are revealed in the works of T. Bashyrov, V. Bilousov, V. Koltsov, V. Koryukin, A. Medvyedyev, Y. Shankin, A. Shchebetenko and others.

While working on the article a wide range of general and applied methods of scientific knowledge has been used, in particular: analytical method for collecting, processing and systematizing scientific information; study of foreign experience, abstract- logical method for generalization and general conclusions.

RESULTS

The nature of modern education is cross-disciplinary, which is the result of social transformations that expand the boundaries of disciplinary understanding of problems and call for interdisciplinary cooperation and integration in their solution. Graduates of educational institutions finding themselves in the working environment, feel the need for additional skills that are not provided by educational programs. This necessitates the need for interdisciplinary education that combines technological trends, scientific principles and business practices.

Since the concept of "interdisciplinary relations" is multifaceted, it is clear that its essence has no fixed definition. It permeates the content, organizational forms of learning, methods, educational and cognitive activities, promotes the development of abilities and cognitive needs, provides effective formation of scientific concepts, in-depth mastering of the studied theories etc. Contemporary Ukrainian scientists refer interdisciplinary learning which they interpret as "the use of knowledge from different fields, their grouping and concentration in the context of the studied problem" to the main types of innovative educational techniques. In contemporary education, the concept of cross-disciplinarity is more widely used.

Cross-disciplinarity is an integrative method. This is a scientific approach, according to which methods of other disciplines are used to study and explain the problem of particular discipline. Cross-disciplinarity is a method that takes a researcher out of a separate discipline, but without cooperation or association (integration) with the relevant disciplines (Galison & Stump, 1996).

The concepts of cross-disciplinarity and interdisciplinarity are very closely related and are often used interchangeably. If you teach a discipline in a broad format, covering many topics, the "cross-disciplinary" relationship is between topics and "interdisciplinary" relation is usually within the topic (Is there a difference between cross-disciplinary and inter-disciplinary?, 2021) .

According to Karin Beland Lindal of the Lulea University of Technology (Luleå, Sweden), an interdisciplinary approach to research is aimed at "crossing disciplinary boundaries in one way or another". Each discipline has its own organizational culture, settings and rules. Crossing disciplinary boundaries is the violation of these rules and the creation of something new (Cross-disciplinary approaches: the 'must have' tools to work with complexity, 2018).

Analysis of American scientific and pedagogical literature (Klein, 2001; Lawrence, 2004; Meeth, 1978; Petrie, 1992; Robbins, 2014) showed that within interdisciplinarity there can be distinguished:

− cross-disciplinariry, which involves the consideration of a problem in one disciplinary field through the prism of another discipline, which has a distinctive epistemological basis (e.g., History and Mathematics); it concerns the problem that crosses the boundaries of one discipline and transfers cognition methods from one discipline to another;

− multidisciplinarity, which helps to solve a problem by comparing knowledge from several or more epistemologically similar disciplines that focus on a definite problem (for example, Physics and Mathematics, French and Latin);

− transdisciplinarity, which goes beyond separate disciplines that are in different epistemological planes and focuses on the problem in such a way as to ensure the acquisition of complex, often new, knowledge that leads to a holistic picture of the world as an effective body of fundamental knowledge.

Cross-disciplinarity as a general term is used for any analysis or recommendation policy based on the methods of more than one science. The concept of "cross- disciplinarity" in the understanding of Erich Jantsch provides a new interpretation of the disciplinary concept and sheds light on the goals and advantages of disciplines for clear articulation of their controversial issues (Jantsch, 1972).

O. Fedorova interprets cross-disciplinary strategy as a strategy of interdisciplinary interaction, in which a particular study is carried out within one discipline from the standpoint of another discipline (Fedorova, 2014).

Cross-disciplinarity means processing a part of reality using the terminology of several disciplines, all of which are devoted to the study of the same subject. Since all sciences tend to offer specialized knowledge, which is more concise, cross-discipline also means finding a level of detailed elaboration that allows you to conform different disciplines.

Cross-disciplinary learning refers to learning activities that relate to a subject beyond the discipline without any integration with other disciplines.

Cross-disciplinary approach is implemented when each of the disciplines that deals with the same or similar subject of research, contributes to solving the problem, using its theory and practical recommendations.

In Brown University (Providence, USA) cross-disciplinary approach is used during the study in various programs. This is especially evident in the program "Literary Art" which is taught at the Digital and Cross-disciplinary faculty. "Literary Art" is a leader program of the university in innovative, experimental, performance, multimedia and cross-

disciplinary practices in literary and linguistic art. Besides, since the early 1990s, Brown University has been a leading institution in the research practice of digital language art. Since the late 2000s, the "Literary Art" has become a course for graduates designed to give students the opportunity to explore cross-disciplinary methods and issues. The programs combine music, visual art, contemporary culture and media, computer science, theater and performance (Literary Arts Brown University, 2021).

The Cogut Institute for the Humanities at Brown University promotes curriculum innovation through its scholarships for lecturers and PhD students. The courses offered by the institute contribute to the development of cross-disciplinary curricula at Brown University (Cogut Institute for the Humanities Brown University, 2021).

Alpert Medical School at Brown University has scientific research programs that offer unique opportunities for cross-disciplinary study in medicine, health, engineering, biomedicine, art and humanities (Alpert Medical School. Brown university, 2021).

The Scholarly Concentrations program is a long-term mentoring program that covers all four years of study at Alpert Medical School. It is an optional element of the curriculum that provides students with additional opportunities to develop their skills and abilities, which are defined by the objectives of the medical education program "Nine Abilities". It is achieved through research, scientific and extracurricular experience in one of the twelve areas of science concentration. The main goal of the program is to provide structure, resources and mentoring for students who plan to conduct research in basic, clinical or translational science or in areas beyond traditional research areas such as global health, medical humanities, health imbalances or medical education. Components of the curriculum include, but are not limited to, meetings in the concentration area, weekly or monthly seminars, field trips, teaching opportunities, journalism clubs, elective courses related to concentration, as well as opportunities for information mastering and oral presentation of research project summaries at the annual academic workshop symposium (Alpert Medical School, 2021).

Scientific concentrations include the following programs: "Reproductive Health", "Translational Research in Medicine", "Doctor as a Communicator", "Aging", "Biomedical Information Technologies", "Caring for Low-Income Communities", "Global Health", "Lifestyle Medicine and Integrative Health", "LGBTQ Health Care and Advocacy", "Medical Education", "Medical Humanities and Ethics", "Medical Technology, Innovation and Entrepreneurship" (Alpert Medical School. Brown university, 2021).

The Department of Cross-Disciplinary Strategies (CDS) operates at the Vienna University of Applied Arts (Universität für angewandte Kunst, Wien, Austria). The University addresses key issues in education and art, as well as the issue of participation and assistance in shaping society in the early 21st century (Institute of Arts and Society, 2021).

The program is aimed at preparing graduates for an independent role in mediation between global interest groups and different professionals. Artistic strategies allow them to intervene in a wide range of contexts. Using practical, artistic and theoretical models of learning, the connections between knowledge, experience and policy are developed and elaborated to meet the complex social challenges of today. The sciences of epistemology, methodology, and history are basic and supplemented by specific issues of art, natural sciences, humanities, social sciences, economic history, and current social and political events. This contributes to independent cross-disciplinary practice in solving global problems such as migration, digitalization, labor, development, environment and nutrition (Institute of Arts and Society, 2021).

Master's programs are aimed at implementing cross-disciplinary projects for sustainable social change in the transformation processes associated with digitalization. Students have the opportunity to apply the acquired knowledge in independent cross-disciplinary projects every semester. Dialogue and cooperation with representatives of society, art, science, politics and economics are supported and promoted within these projects.

The IT University of Copenhagen (Denmark) also develops and actively implements cross-disciplinary courses to enable students to become skilled, efficient and critically relaxed employees (Cross Disciplinary Team Work, 2021). Practical work is aimed at integration of the conceptual process of critical research and reflection. The goal is not to gradually improve services and products, but to explore and expand the space for innovation through cross-disciplinary collaboration and prototyping. An open research project is a means for students of different curricula to interact with each other.

The George Washington University (Washington, DC) offers many interdisciplinary programs in its schools and departments, among which the most relevant are: "Digital Technology", "GWTeach and STEM Teaching Minor", "Linguistics", "Naval Science", "Sustainability", "Program for Outstanding Students", "Women's Leadership Program" etc. (The George Washington University, 2021).

The Hong Kong University of Science and Technology (Guangzhou) is a specially established cross-disciplinary university. Cross-disciplinary model of active learning that combines research-oriented learning with a focus on preparing students for leadership and technology entrepreneurship takes the central place in academic structure. All activities are aimed at providing high-quality and transformational learning experience for young talents, creating opportunities to meet real needs and predict further opportunities in potential labor markets. The following programs are implemented at the university: "Financial Technologies", "Innovation, Policy and Entrepreneurship", "Urban Management and Design", "Earth, Ocean and Atmosphere Sciences", "Microelectronics, Sustainable Energy and the Environment", etc. (The Hong Kong University of Science and Technology, 2021)

Roberts Wesleyan College (Rochester, NY) offers a unique opportunity within the Bachelor's degree program of cross-disciplinary research to pursue an individual specialty that meets personal interests and professional goals of students. Cross-disciplinary researches offer flexibility to create an individualized study program. There are 3000 possible combinations to create your own specialty, the result of which is a 100 % employed graduate or the one admitted to post-graduate school in the first year after graduation (Roberts Wesleyan College, 2021).

Harvard Graduate School of Education (Cambridge, MA) focuses on disciplinary and cross-disciplinary research of how disciplines from history and art to biology and mathematics embody culturally valuable knowledge and ways of thinking that deepen understanding of the world and the ability to create products, solve problems, and explain phenomena. In order to solve today's social problems of climate change, mass migration, global health, and digital revolution, which require the integration of disciplinary views, the university has implemented a number of cross-disciplinary programs. Among them are "Culture of Thinking", "Education of Citizens of the World through the Prism of the United States and China", "Innovations in Education", "Interdisciplinary and Global Research", "Learning to Think, Thinking to Learn" and many others (Harvard Graduate School of Education, 2021).

CONCLUSIONS

Analysis of cross-disciplinary programs in foreign educational institutions allows to make a conclusion about necessity to implement similar programs in domestic system of

professional education. The important feature of vocational training based on cross-disciplinary approach is its competitiveness in the labor market. This is due to the fact that the diversity of its activities requires knowledge from different fields, which allows to adapt to the changing demands of the labor market. Cross-disciplinary approach makes learning effective, as it allows to identify and use only relevant information for learning while unnecessary information remains beyond the educational process.

Cross-disciplinarity helps to develop and quickly adapt to the unpredictable conditions of the world. This is possible only through a combination of current knowledge with modern skills and abilities. All this leads to the development and formation of vital competencies that allow to solve problem situations. In the work of a contemporary professional, it is impossible to consider the problems only from the point of view of one discipline, because they must be competent in two or more specialties.

In our further research, we will pay more attention to The Scholarly Concentrations program and study in detail twelve areas of science concentration to consider possibilities of implementing a similar program in Ukrainian education system.

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