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ABSTRACT
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of Doctor of Sciences

THE PROBLEM OF INTERDISCIPLINARY PEDAGOGICAL PARADIGM IN HIGHER EDUCATION

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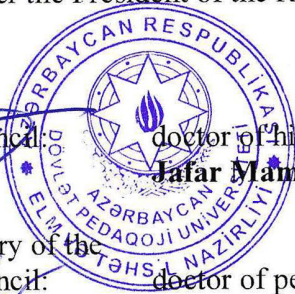
GENERAL CHARACTERISTICS OF THE RESEARCH

Relevance and development of the theme. Today, one of the issues deemed detrimental to higher education is the interdisciplinary educational paradigm. There are several elements and reasons why the problem under investigation is relevant. Internal factors are covered in the first section. First of all, it is the result of the successful policy of the Azerbaijani state in the field of education.

Education policy in our country, the development of social and humanitarian sciences as a whole are among the main strategic goals of our state. National leader Heydar Aliyev, during a meeting with the intellectuals of the republic on September 21, 1993 at the Azerbaijan National Academy of Sciences, noted that the main task of the humanities, which is the scientific basis of the country's policy, is to study and generalize the world experience, "to determine the main patterns of social development of our state in the political, economic, social and spiritual spheres"[1].

In his speeches, the president of the Republic of Azerbaijan Mr. Ilham Aliyev emphasizes the main idea that the main strategic goals of education in our Republic serve the formation of human capital.

The second part includes global external factors. This includes a set of documents reflecting the integration of the Republic of Azerbaijan into the world educational space, agreements, integration into the educational space of Bologna and the European Union and CIS countries, joining the Education Roadmap in the framework of the Euro-Eastern Partnership, also documents of the Cabinet of Ministers of the republic, reflecting the process of integration of Turkey and Turkic-speaking countries into the educational space, laws that form the core of the normative and legal framework, rules and norms of education regulation.

The research is also relevant for the following reasons:

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[1]"Azərbaycan" qəzeti, 1993, №185(697).

1. Complexity of human-nature, society, science and technology system. Interdisciplinary research and scientific approach make the study of complex systems remarkable.

2. Interdisciplinary direction in the field of natural sciences. The fact that natural sciences are more interested in the investigation of real-world problems brings those sciences closer to the method of interdisciplinary approach.

3. Interdisciplinary direction in social sciences. Human societies are extremely complex systems. Problems in the social sciences require researchers (traditionally including anthropologists, economists, political scientists, psychologists, educators, and sociologists) to cross disciplinary boundaries as they examine the effects of geography, history, education, cultural traditions, wars, and sacred belief systems.

4. Interdisciplinary direction in the field of pedagogy and didactics. In the 21st century, the sciences of pedagogy and didactics give more priority to methodologies and scientific approaches such as cognitivism, constructivism, pragmatism, in order to investigate the nature and dynamics of complex pedagogical phenomena, in general, complexity and evolution. When the essence of knowledge and research is discussed, the role of social epistemology, along with classical epistemology, is specially mentioned.

5. Another factor that actualizes interdisciplinary education and research is the modern university student's need for systems thinking and context thinking. Systems thinking should be applied to solving complex problems. For the purposes of this study, the main meaning of systems thinking is the ability to divide each into its constituent parts in order to identify the problem, its internal and external factors. It is about how these parts relate to each other and to the problem as a whole, and to determine which parts are touched upon by different disciplines.

6. Traditional education favors the analytical mind more. This type of mind may be less useful to people in everyday practical life than the creative and practical mind. The purpose of interdisciplinary education should consist in preparing students to live in a world where important, successful intelligence prevails, and not just a pas-

sive, analytical mind. The reason should be sought not in the classroom, but outside it. The diversity and complexity of real-world problems require creative and practical thinking. For example, it takes an analytical mind to know the market for products, but the creative mind is primarily the mind that produces the product and manages to do it sustainably.

7. Interdisciplinary direction in the humanities and arts. The humanities (art history, history, literature, music education, philosophy, and religious studies) use expression, effect, value, and meaning to study the place and role of real-world problems in human life and in shaping its lived, lived experience. Each generation seeks its own system of concepts. From this point of view, literature, history, art are reinterpreted, the writing of biographies of historical figures with a new perspective and the creation of new forms of artistic expression are included in the agenda. Such an approach contributes to the constant expansion of the phenomena studied by the humanities.

In some studies, the terms "interdisciplinarity" and "interdisciplinary" are mistakenly used as synonyms. But the differences between them must be taken into account. Thus, the term "interdisciplinary" has a more narrow methodological meaning and consists of formally connecting different subjects during the lesson. However, the term interdisciplinary or "interdisciplinary field" in the sense of methodological and scientific approach is a universal category that includes fields of science such as knowledge, science, research, theory, education and didactics.

The field of study of interdisciplinarity is becoming more and more important and continues to expand. It is reasonable to classify the analysis of scientific approaches reflected in the literature on the development of the topic, conditionally, on three problems. The first is the genesis of interdisciplinarity, or the history of its formation. The second is interdisciplinary discourse or theory. Third, interdisciplinary structure or relationship with organizations and institutions. The degree of study of the problem on all three requests is divided into two groups. The first group includes directly the problem, and the second group includes directly, that is, indirectly, the studied research. The di-

rections of scientific research carried out in this area in the CIS countries, including in our republic, can be defined as follows. Researchers - philosopher[2], historians[3], sociologists[4], methodologists[5], scientists[6], pedagogues and didactics[7], who try to study the subject directly, focus more on the nature and typology of the subject and interdisciplinary field, the relationship with practical fields, the interdisciplinary teaching and learning process, and the nature and functions of the higher education. In our country, it is possible to show researches that directly or indirectly touch on this topic A.O.Mehrabov while speaking about the organization of interdisciplinary relations in the educational process, the main directions of reforms in the system of higher education, emphasized the role of interdisciplinary research in impro-

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[2] Ажимов Ф.Е. Что такое междисциплинарность сегодня? (Опыт культурно-исторической интерпретации зарубежных исследований). Вопросы философии. 2016. № 11, с. 70-77

[3] Кукарцева М.А. Междисциплинарность и историческая дисциплина: особенности отношений // Проблемы исторического познания, 2013. №1, с. 23-34; Степин В.С. О философских основаниях синергетики. Синергетическая парадигма. Синергетика образования. Москва: Прогресс-Традиция, 2007. с. 96-102

[4] Князева Е.Н. Пробуждающее образование. Синергетическая парадигма. Синергетика образования. Москва: Прогресс-Традиция. 2007. с. 369 -387.

[5] Касавин И.Т. Междисциплинарное исследование: к понятию и типологии // Вопросы философии, 2010. № 4, с. 61-73.

[6] Мирский Э.М. Междисциплинарные исследования: дисциплинарная организация науки. М.: Наука, 1980. 304 с.; Позднева С.П. Междисциплинарность как тотальный феномен познания XXI века: становление междисциплинарного словаря науки. Известия Саратовского университета. Новая серия. Серия: Философия. Психология. Педагогика, т.9. 2009. №2, с. 114-123.

[7] Осмоловская И.М., Краснова Л.А. Проблема междисциплинарности в исследованиях процесса обучения. Образование и наука, т. 19. 2017. № 7, с. 9-24; Петрова, Г.И. Междисциплинарность университетского образования как современная форма его фундаментальности. Вестник Томского государственного университета. Философия. Социология. Политология, 2008. №3, с. 7-13.

ving the quality of higher education at the university[8]. Another researcher, Niklas Luhmann, emphasizes the place and functions of interdisciplinary understanding in his sociology[9]. Another article is devoted to the philosophical issues of interdisciplinary research.[10] Thus, despite the urgency of the problem, its interest and usefulness as a new field of science, we can say that this problem has not been the subject of a separate monographic work in our country. Considering the new textbooks, teaching aids, programs, syllabi and curricula published in our country since 2000, it is possible to conclude that our education has moved to the intermediate level of integrative curricula and the initial stage of the interdisciplinary approach. In addition, the expansion of subjects in the higher education system, the projecting of research in a co-operation, the wide use of ICT and interactive forms of teaching, positive experience gained in the field of assessment, the interest of social institutions, international organizations and the non-governmental sector in education give positive hope that our education can start interdisciplinary reforms.

In the scientific literature of Western Europe and North America, special attention is paid to the study of interdisciplinarity and its types. Disputes, debates and polemics around this issue continue today. For both schools, alternative and pluralistic concepts, theories, methodologies and conceptual approaches are typical. We classify their experiments and theories in the form of two schools of ideas, conditionally different, but at the same time inclined to converge in some principled points. The first is Anglo-Saxon and American, based on the concept of the curriculum, the other is a French and continental European school, based on the concept of didactics. However, despite their differences and disagreements, the two schools tend to unite in their approach to and addressing several important issues

[8]Mehrabov A.O. Müasir təhsilin konseptual problemləri. Bakı: Mütərcim, 2010. 516 s.

[9] Qurbanov F. Autopoyesiz və sinergetika: sosial təşəkkül metaforaları. Bakı: Adiloğlu, 2007. 486 s

[10]Məmmədzadə İ.R. Fənlərarası tədqiqatların fəlsəfəsi. Fənlərarası tədqiqatlara həsr olunmuş "Beynəlxalq yay məktəbi"nin toplusu, Bakı, 2014, s. 13-24.

related to interdisciplinary and its types. The Anglo-Saxon and American concepts focus on teaching and learning practices. It offers a functional, practical and useful interpretation of interdisciplinary and its types, aimed at educational and pedagogical methods for solving problems in society, other issues of the real world. On the other hand, the European concept focuses on epistemology, the interrelationships between disciplines, and therefore the acquisition of disciplines and interdisciplinary knowledge.[11]

In the field of education, both approaches complement each other. A general conclusion can be drawn that both approaches effectively consist in successfully combining the forms of activity of interdisciplinary work with the goals and cognitive content of interdisciplinarity. According to the Western and American school, transdisciplinarity is the highest stage in the development of knowledge as a continuation of interdisciplinary strategies. For this reason, interdisciplinarity in America is understood as "transcendent interdisciplinarity".[12]

One of the controversial interdisciplinary topics in US and European discourses is related to the nature of transdisciplinarity. Transdisciplinarity actually seems like a buzzword. In the beginning, its general definition was "a system of axioms common to many disciplines"[13]. Decades later, the use of the term expanded. It is now associated with comprehensive paradigms (e.g. general systems, feminism, Marxism), broad interdisciplinary fields (e.g. area studies, cultural studies), and more comprehensive but specific disciplines (e.g. philosophy, geography, religious studies)[14].

Multidisciplinary aligns disciplines, but does not combine and does not integrate disciplines that join the interdisciplinary process

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[11] Lenoir Y. Curricular and Didactic Conceptions of Interdisciplinarity. In Issues in Interdisciplinary Studies, 2015. №. 33, p. 39-93.

[12] Angelique, C. Interdisciplinarity: a literature review. University of Southampton, 2007, p. 50-51; Repko A. Defining Interdisciplinary Studies. 2008, p.3-26; Klein J.T. Prospects for transdisciplinarity. Special Issue on Transdisciplinarity. Futures, 2004 (36), p. 515-526.

[13] Klein J.T. Prospects for transdisciplinarity. Special Issue on Transdisciplinarity. Futures, 2004 (36), p. 515.

[14] Yenə orada, s. 516.

into a complete (system) form. The crossdisciplinary approach includes interaction, joint cooperation, interaction between disciplines, but does not achieve integration or synthesis. However, both are preconditions and initial conditions of interdisciplinarity. Transdisciplinarity as the most general and broad model of ideas overcomes the views of disciplines on the world, breaking the boundaries of disciplines that are connected to the interdisciplinary process and going beyond them.

Taking into account the relevance of the research, the topic of the dissertation was determined as follows: "Problem of interdisciplinary pedagogical paradigm in higher education".

Object of the research is a conceptual analytical analysis of the characteristics of paradigm and polyparadigm in the social sciences, pedagogy and education.

Subject of the research consists in examining the essence, genesis, structure and typology of the general and special scientific pedagogical paradigm of the interdisciplinary paradigm in higher education methodology, and the peculiarities of higher education didactics.

The purpose and tasks of the research. The purpose of the research is to conduct a systematic analysis of the genesis, structure and discourse of the interdisciplinary paradigm in higher education and pedagogy.

Tasks of the research:

- the essence and criteria for the use of general scientific and special paradigm concepts have been determined;

- polyparadigmism, its characteristics, the definition and typology of the interdisciplinary paradigm in higher education and pedagogy have been comprehensively analyzed;

- the dynamics of changing paradigms of higher education in the context of the challenges of our modern era have been shown;

- in the context of differentiation and integration of scientific knowledge, the evolution of disciplines from specialization to interdisciplinary dialogue has been widely interpreted;

- the objectives and pedagogical approaches of interdisciplinary higher education have been widely clarified;

- the philosophy of interdisciplinarity, the concepts of ontological and epistemological interdisciplinarity have been investigated;

- cognitive and constructive foundations of interdisciplinary cognition - epistemological interdisciplinarity have been described in detail;

- ways of instilling interdisciplinary critical thinking skills in higher education have been determined;

- a broad theoretical description and understanding of curriculum and didactic-epistemological concepts of interdisciplinary teaching and training have been given;

- the relationship and characteristic features of the problem and problem-oriented interdisciplinary educational paradigm have been brought to light;

- pedagogical methods of problem-oriented interdisciplinary teaching and training have been described.

During the research, the following **research methods** were used: theoretical analysis, observation, interview, survey, questionnaire, mathematical-statistical methods, pedagogical experiment.

The main provisions for defense.

1. Conceptualization of interdisciplinary higher education. Approaches to interdisciplinary higher education are changing, and disputes about terminology are still ongoing. There are different approaches to the term and concept of "interdisciplinarity" (abstract noun) and "interdisciplinary" (adjective), disputes and polemics continue around their meanings.

2. In modern scientific literature, the term "discipline" (subject) is adopted in the general meaning – "educational environment" and "teaching a pupil (student)". The term "subject" used in the Azerbaijani language means the meaning we have mentioned. The most common issue is related to the prefix "inter" (preposition). Summarizing these disputes, the meanings of the term " inter - (disciplinary)" are defined as follows: controversial space between disciplines; activity based on subject concepts - integration; the result of integration, which provides cognitive progress - contains "comprehensive understanding" or synthesis.

3. In higher education, interdisciplinary field studies - country studies (for example, Middle East studies), regional studies, and materials science, which form the basis of interdisciplinary courses, and interdisciplinary programs including highly integrated fields of science such as - environmental studies, urban studies, sustainable development studies, didactics and cultural studies already exist.

4. In the social sciences, including pedagogy, the term interdisciplinary scientific paradigm (model, approach) is a broader concept and general term than methodology and theory. The concept of interdisciplinary scientific paradigm includes the following elements:

- issues related to epistemology (knowledge) and cognitive theory;

- determining the objectives of the study – understanding, explanation, normative assessment, etc.;

- accepts meta-theories in which concrete theories are located;

- basic assumptions of the analysis unit about human behavior, not depending on the organization of individual or social groups;

- the role of ideas and interests.

5. We distinguish the general scientific paradigm and the concrete-scientific pedagogical paradigm of education. We characterize pedagogy as a social science as a polyparadigmatic science.

6. Since the concept of paradigm is not always clearly defined, the types of paradigm in pedagogical science are more than twenty. The first concept of the paradigm - a model of scientific activity, consists of a set of norms, criteria, research standards. The second concept of the paradigm - as the main models or strategies of Education, interprets it as the basis, ideas and approaches of the educational system. In such an interpretation, the concept of the paradigm of education (upbringing) is usually applied. The educational paradigm is accompanied by terms reflecting the main direction of education, methods of identifying the source of pedagogical goals.

7. The definition of the category "pedagogical paradigm" includes the following elements: 1) a complex of theoretical, methodological and other rules, a set of certain requirements (regulators), which are guided as an example (model, standard) when solving pe-

dagogical problems and adopted by the scientific pedagogical society at each stage of the development of pedagogy; 2) model or models for solving problems in a certain period of time and a complex of scientific achievements accepted by the majority; 3) a system of socially significant stable ideas and theories reflecting the patterns of development of education; 4) model for solving research and practical issues in the field of pedagogy and education; 5) phenomena of pedagogical activity, pedagogical ideals, concepts and ideas about upbringing and teaching of the era, which determine the essence of the pedagogical experience of the era.

8. type of pedagogical thinking (worldview) characteristic of a certain period of the history of education.

Scientific novelty of the research.

- For the first time in the post-Soviet and Azerbaijan pedagogical and educational space, the dissertation work has been comprehensively studied at the level of a doctoral dissertation in the context of the essence, types, relationships with the concept of a generalist paradigm, distinctive and similar features of the interdisciplinary pedagogical paradigm as a model of higher education, challenges of modern times and pedagogical polyparadigmal (paradigmal pluralism).

- the interdisciplinary pedagogic and educational paradigm was studied as a conceptual framework built on three levels - genesis, structure and discourse, interdisciplinary education, knowledge, research, theory and teaching-learning didactics in the "man-nature-society-science-technology" systems. The history, methodology and socio-cultural structure of the interdisciplinary approach, their interrelationships and effects have been studied and investigated at the system level, in the form of ideas and practices;

- as an interdisciplinary study in the dissertation work, its object and subject have been analyzed in the context of the junction of natural and socio-humanitarian sciences (pedagogy, educational studies, didactics, history, philosophy, social anthropology, culturalogy, sociology, literature, linguistics, art, etc.) and their mutual effects;

- the place and functions of the category of interdisciplinarity in pedagogical, philosophical and didactic systems, its elements and functions as an educational phenomenon and strategy, the characteristics of its epistemological (epistemological) and ontological models have been clarified;

- the essence of the interdisciplinary pedagogical paradigm and the criteria for its use, interaction with the general scientific paradigm have been thoroughly studied;

- the theoretical and practical significance of the interdisciplinary scientific approach in the context of the phenomenon of polyparadigmal in pedagogy and higher education has been shown, its definition and typology by the author ishas been presented.

Practical significance of the research. The significance of the results and practical proposals of the research work is that these proposals originate from the context of the epistemological-didactic study of interdisciplinary higher education, new social epistemology. The results of the research work are aimed at bridging the gap that has arisen between the theory and practice of the educational process at the university.

Theoretical significance of the research. Interdisciplinary theoretical and methodological approaches and principles of current research, didactic concepts of higher education, theory, knowledge, research, teaching and learning not only make significant contributions to modern higher education pedagogy and didactics, even in this area of science, the post-Soviet pedagogical science and education stimulates the discovery and development of new theoretical and methodological directions.

Methodological bases of research. The essence, typology, structure, and functions of the concept of interdisciplinary paradigm have been studied by applying the methods of "essentially controversial concepts and categories" and "semantic conceptual analysis" within the framework of analytical and linguistic philosophy methodologies.

Approbation of the research. The process of approbation of the dissertation has been carried out through the publication of scien-

tific articles covering the main content, objectives and results of the research work in local and foreign publications, speeches and reports at various local and international symposiums, conferences.

The total volume of the dissertation with a mark with the mention of the volume of the structural units of the dissertation separately. The dissertation consists of an introduction, 4 chapters with 13 paragraphs, a conclusion, a list of references and an additional page. Introduction - 10 pages, 18697 signs, Chapter I - 44 pages, 84981 signs, Chapter II - 46 pages, 89013 signs, Chapter III - 57 pages, 106252 signs, Chapter IV - 69 pages, 120103 signs, conclusion 5 pages, 8819 signs , list of references - 38 pages, add-ons 27 pages the total volume of the dissertation is 299 pages, 427865 signs.

THE MAIN CONTENT OF THE RESEARCH

In the **"Introduction"** the relevance of the problem is substantiated, the object, subject, goals and objectives of the study, its main provisions, scientific novelty, theoretical foundations and practical significance are clarified.

Chapter I of the dissertation is called **"Theoretical and methodological foundations of the interdisciplinary paradigm in pedagogy and higher education".** This chapter includes three paragraphs. In the first paragraph of the chapter entitled ***"The essence and criteria for the use of general and special-scientific paradigm concepts", the essence of the concepts of "general-scientific"*** and "special-scientific" paradigm was disclosed, the criteria were defined, typology, their interaction were widely analyzed in the context of the methodology of science. From a methodological point of view, it is assumed that the specification of the status of the paradigm concept and the criteria for benefiting it as a scientific term can stimulate the adoption of a general definition of the interdisciplinary paradigm in the field of pedagogy and higher education. Most of the theories related to the concepts of universal and specific scientific paradigm were formed under the influence of the outstanding American physicist,

scientist and philosopher Thomas Kuhn. T.Khun showed two different meanings of the universal term "paradigm": a) exemplary paradigm, B) "core of the subject" (disciplinary matrix). He was the first to use the term "paradigm" to denote a certain, concrete scientific achievement. Summarizing the studies carried out, more than 20 meanings of the general scientific paradigm are combined into 3 groups: a) philosophical, metaphysical and metaparadigmas; 2) sociological paradigms; 3) artifact or constructive-conceptual paradigms. The social paradigm belongs to the second group and contains the following meanings: "generally accepted scientific achievement", "concrete scientific achievement", "aggregate of political institutions", "generally accepted legal decisions". By scientific paradigm, more precise meanings were meant: 1) theory recognized by the scientific community; 2) rules, norms and system of scientific practice; 3) the interaction of the general scientific paradigm and individual or specific paradigms of all scientific, branches of knowledge. Under the influence of this discussion, T.Khun revised his definition of the paradigm in content and carried out this work by applying the term "disciplinary matrix". Thus, under the influence of his ideas, discussions about the paradigm moved from the natural sciences to the plane of the social sciences, starting from the 70s of the last century. Natural, pedagogy and educational sciences have not been left out of these discussions. The dissertation shows that in those years, education took advantage of the scientific paradigm for the study of the educational-training process. Pedagogy and education paid special attention to the scientific paradigm in the cause-and-effect relationship of how teachers organize teaching and learning, with what methods and means they regulate their interaction with students. The 80s of the last century resulted in the introduction of the concept of a social paradigm into science. At that time, the concept of a social paradigm was attributed only to the social sciences.

The concept of paradigm in socio-humanities is distinguished from the concept of paradigm belonging to natural sciences. Thus, according to our definition, the concept of a paradigm in the methodology of science or in the philosophy of science consists of a system

of scientific ideas and theories that have gained dominance in a certain period of time.

The second paragraph of the chapter is called ***"Polyparadigmality in pedagogy and higher education: definition, structure and typology of interdisciplinary higher education paradigm"***. The purpose of the paragraph, firstly, consists in substantiating polyparadigmal in pedagogy and education. The second is to show the theoretical and practical significance of polyparidigmal approaches and methodologies in the context of the "paradigm crisis" that has arisen in modern pedagogy and educational sciences. The third is to elaborate on the structure and typology of the interdisciplinary paradigm of higher education.

The interdisciplinarity of the social sciences, including pedagogical and educational ones, is a generally accepted fact by all researchers. Education, or the study of the educational system and the didactic system, requires the cooperation of various disciplines, the integration and synthesis of methods, approaches, theories, concepts. For example, to ensure the formation of the student as a whole (system) and creative person in pedagogy and didactics according to the interdisciplinary approach the formation of a perfect worldview, its place in the system of nature and society (philosophy and social philosophy, sociology, geography, geopolitical sciences), its socio-biological and social existence (anatomy, sociobiology, evolutionary sciences), the object of cognitive and cognitive process, education and the formation of the individual's "self" and mental activity as a subject requires the joint collaboration of various sciences, such as general, social, and cognitive psychology, neuropsychology, and developmental pedagogy. As a result, a perfect system is built that receives a transition from didactics based on topics, units of analysis that make up the traditional line of content to the didactic system of inetrdisciplinary concepts based on the integration and synthesis of methods, perspectives, methods of cognition and worldview of multiple disciplines. Thus, the interdisciplinary scientific approach critically analyzes the perspectives of relevant disciplines, integrates and synthesizes different views, perspectives, ideas and methods for a more comprehensive understanding of the problem.

Thus, the interdisciplinary scientific approach critically analyzes the perspectives of relevant disciplines, integrates and synthesizes different views, perspectives, ideas and methods for a more comprehensive understanding of the problem. The structure of the interdisciplinary paradigm was explained by applying a system approach and analyzed at the levels of pedagogical paradigm, educational paradigm, and educational paradigm. The pedagogical paradigm was studied not only as a leading theory, but also as a whole pedagogical worldview, along with all the results that were produced thanks to it. Accordingly, all other scientific categories of pedagogy, including the special-scientific interdisciplinary paradigm, were subordinated to the category of "general scientific pedagogical paradigm".

The systems approach we applied to study the development of the interdisciplinary paradigm in higher education includes three structural elements a) genetics (historical and cultural conditions), b) discourse (interdisciplinary educational theories) and c)structure (organization or institutionalization of interdisciplinary higher education) and five subsystems.

The system approach has been used to study the epistemological-didactic development of interdisciplinary higher education at various sociocultural levels. These sub-systems consist of five fundamental categories, or concepts, which include the objectives of interdisciplinary education at the level of theory and practice: interdisciplinary (single subject), multidisciplinary (multiple subjects), crossdisciplinary (intersection and junction points of subjects), interdisciplinary (interdisciplinary space), transdisciplinary (breaking and going beyond the boundaries of subjects).

These categories are instrumental categories and concepts in relation to the purpose of higher education – a whole, perfect person, a broad outlook, a carrier of creative, critical thinking and reflexive thinking, the upbringing and literacy of a citizen armed with useful knowledge and skills for the country and society. Thus, the purpose of interdisciplinary higher education necessitated inclusion in the object and subject of pedagogical and didactic analysis in the context of complexity of the most common system - "human-system"or

"anthropic principle" i.e. "man - nature" ("man-society", "man - science", "man-technology") sub-systems covering the participation, movement and activity of man in both worlds.

According to our definition, the interdisciplinary higher education model is a scientific approach or paradigm that seeks to solve complex problems of nature, society and human cognition, which cannot be solved within the framework of a single subject.

The main structural elements of the interdisciplinary paradigm of higher education are defined by us as follows: interdisciplinary, multidisciplinary and transdisciplinary.

The main purpose of the third paragraph *"Changing paradigms of higher education in the context of modern challenges"* of Chapter II, is to study the role of interaction and relationship of global (international) and local (regional and national) education in the development of higher education paradigms. Such an idea is particularly emphasized that globalization, which is the main reality of the modern era, continues to have a profound impact on higher education. Our modern world sees globalization as an increasingly integrated world economy, a world of realities formed in a complex socio-cultural complex, new information and communication technologies (ICT), the emergence of a system of international knowledge and service networks.

Internationalization has become a very important factor at the regional and international levels. The Bologna Process and the Lisbon Strategy applied in Europe are clear examples of international participation at the global, regional and local levels. However, the Bologna process, applied in more than 40 countries, is a voluntary process of establishing the "European Higher Education Space".

In this paragraph, the changes taking place in the paradigms of higher education are systematized on the following examples.

1. "Student is a knowledge manager and knowledge producer". We can observe the progress from the idea of passive perception of knowledge by the student in the educational process to the idea of "illumination of the student's intellect". Today's student should not only be limited to applying his knowledge, but also be an informed person who produces and interprets his knowledge of tomorrow. The

pedagogical task should focus on the transfer of less factual knowledge, more on mental skills of students for solving simple and new complex problems and their application in practice.

2. *"*Basic educational skills paradigm*"*. Reading, writing and math skills remain the most important skills as before. But, in addition, it is important to focus on the different combinations of five more fundamental skills with the three skills we have mentioned. These skills are: creativity; conceptualization (theoretical analysis); cooperation; communication and computerization. Learning to think critically and creatively, carry out logical reasoning, receive interpretation and knowledge in a relative order, create will have an even greater advantage from day to day in the 21st century.

3. *"*Re-integration of knowledge*"*. In the 18th, 19th and 20th centuries, preference was given to "decontextualization", followed by accuracy in measurements and control in practice. In order to study complex (dynamic, multilevel) events, it was necessary to turn to various analyzes. It was established that at the end of the 20th century, the reason for such a degree of development and spread of quality methods was, finally, the result of our inability to cope with contexts and numerous causal relationships.

4. "Revitalization of subjective opinions". Oddly enough, we traditionally prefer "objective knowledge" to "subjective information". We are now learning how to control or overcome the contradictions related to influences and the socio-psychological situation. Although modern social, psychological, brain and biological sciences attach great importance to this effective, emotional, situational and social sphere of human activity, we are more inclined to consider cognitive functions or social superstition, without dependence on human feelings and influences.

5. "Rebalancing of the assessment". Assessment of the results of learning within the framework of accountability (responsibility) will still continue for some time, but in the future, assessment of the impact and development of learning and learning processes will likely create inconvenience. Most of our intervention in education consists of tests and errors that have not been analyzed or studied little. We believe that

evaluation in education will influence teaching, learning processes and results, develop them by considering the importance of accountability.

6. "New functions of learning". Learning is a social process. Human intelligence is not only a social phenomenon, it is practiced both in the context of social interaction and consensus, also, just as conditioned by that experience, the teaching and learning process begins to be recognized as a social phenomenon.

In the first paragraph entitled ***"Differentiation and integration of scientific knowledge. From specialization in disciplines towards interdisciplinary dialogue of disciplines"*** of Chapter II of the dissertation entitled **"Didactic-epistemological analysis of knowledge and interdisciplinary field in interdisciplinary higher education"**, the idea is justified that beginning in the 17th century, the excessive increase in objects of study led to specialization in scientific disciplines and research. Today, despite the enormous amount of knowledge available about this development, more and more people believe that interdisciplinary cooperation is essential. Because the cooperation of disciplines can lead to a creative approach to problems and therefore to their productive solutions.

In the 18th century, science became a special activity for the accumulation and identification of all possible knowledge, the description and systematic design of topics, as well as for more vivid interaction between participants in scientific societies. This has led to a significant increase in science in terms of the amount of information produced and communicated. Thus, overload and integration problems arose. This was considered as a prerequisite for internal differentiation in disciplines. When the volume of experimental data and scientific theories reached a crisis point, it led to innovations and gave impetus to future research. Thus, the internal differentiation of scientific activity in disciplines began to develop in two ways. Firstly, the development of abstraction was realized, for example, through the mathematical conceptualization of objects. This means that science received its information about the world directly from the environment. Instead, more and more new objects were being reconstructed and organized according to independent, usually mathematical criteria. At the same

time, as a second path of development, the accumulation of knowledge from a modern scientific point of view was expanded at the expense of new disciplines. Here, at least, two conclusions can be drawn: firstly, the understanding of specific objects as the initial stage of the formation of the subject resulted in the organization of problems in the disciplines.

Secondly, it is possible to cite molecular biology as an example, arising from the systematic application of physical methods to the problem of explaining life. The result was the emergence of a new sub-discipline dedicated to the study of the former "biological" phenomenon at the molecular level, which turned new methods and techniques into demand and introduced new concepts.

It is shown that the institutionalization of knowledge contributed to the development of subject and university models. Three types of ideal models of higher education (HE) have been explained. The first is the German or Humboldt model of "net knowledge production". This model was based on three ideal principles: autonomy of HE enterprises; freedom of academies to choose research problems and methods within the established subject methodology and to publish their results (even if they are not appropriate); the freedom of lecturers to plan their own teaching content and methods.

Napoleonic model. This model was characterized by the creation of numerous higher educational institutions and autonomous state research centers. Since the Napoleonic model was based on direct state control over HE enterprises, the distribution between educational and research activities in the public sector, Humboldt significantly differed from university ideas. In this model, universities did not have a monopoly on state research centers.

English-American model. This is a model that meets the market needs of education and research. The Humboldt and Napoleonic models differ sharply from the Anglo-American model based on the idea of a university as a center of education and research in accordance with the demands of society. According to this model, universities are expected to conduct teaching and research. However, the content of both activities should be more reckoned with the "requirements" of society, rather than satisfying the intellectual interests of the scientific

community (as in Humboldt's model), the demands of the country or political goals (as in Napoleon's model). Within the Anglo-American model, universities prefer the "interdisciplinary problem solving" method. Sufficient space is allocated to interdisciplinarity, because the experience of the scientific community and its ability to communicate with a wide range of social subjects, as a rule, is evaluated by their ability to solve a certain number of "social problems".

In the second paragraph entitled ***The goals and pedagogical approaches of interdisciplinary higher education"*** of Chapter II, it is noted that interdisciplinary higher education combines different components in two or more subjects in a single training program (curriculum, project). The goal of interdisciplinary higher education is to develop cross-cutting skills such as interdisciplinary thinking, knowledge, and research within the framework of interdisciplinary higher education.

According to the definition we have proposed, interdisciplinary higher education consists in the synergy of constructive-epistemological and pedagogical knowledge, skills, abilities and habits aimed at understanding and solving complex phenomena and problems of nature, society, human thinking and cognition.

Summarizing the scientific literature on the goals of interdisciplinary education, three standard goals of interdisciplinary education are identified: a) "integration of knowledge" – the ability of everything in the world to interact, to be perceived in greater content and context; b) "freedom of research" – the opportunity and choice to educate the issue, regardless of artificial disciplinary barriers; v) "innovation" – opportunities to think unconditionally and make original contributions. The addition of deductive thinking, reasoning by analogy, in particular synthetic thinking, are justified here.

According to our definition, the main purpose of interdisciplinary education and training is to develop joint team work, cooperation between professions, how different subjects are applied by professional pedagogues and teachers, and to strengthen critical and creative thinking, reflexive thinking about all this. The following objectives of interdisciplinary teaching-training have been identified:

- to develop and promote joint teamwork by creating an atmosphere of mutual respect and evaluation for relevant subjects;

- to develop knowledge without necessarily mastering it and to understand other subjects;

- to increase interdisciplinary communication in the learning environment, which tends to be less competitive than the work environment, and thus to develop understanding and cognition, to reduce inter-professional "hostility";

- to achieve effective interdisciplinary communication by learning the language of different subjects;

- to learn the rules and ethical principles of other disciplines..

Analyzing the scientific literature, various sources, we classified interdisciplinary teaching-learning strategies and pedagogical methods into three groups.

1. Collaborative (cooperative) teaching-training strategies. There are three types of joint team teaching-training:

- two or more teachers share their experience and responsibilities
- planning as a team, but individual training
- joint planning, training and evaluation of teaching practice.

2. Interactive teaching-training strategies

3. Program-level strategies

The following table shows a synthesis of interdisciplinary teaching-training strategies and pedagogical methods.

Table 2.2.1

Synthesis of interdisciplinary teaching-training strategies and pedagogical methods

Strategies	Pedagogical methods
1. Joint (cooperative) teaching	– Conduct joint planning and negotiations with the teacher in advance – Conducting joint consultations with industry representatives – Application of rotation in training – Establishment of an educational society – Joint development of syllabus and research plan on topics

2.Interactive teaching-training	– Project-based teaching – Research methods on topics – Game-based teaching – Simulations – Virtual methods – Peer assessment and testing – Teaching with the help of peers – Teaching in small groups
3. Program-level strategies	– Interdisciplinary programs – Basic courses covering materials from various disciplines – Research carried out in the early stages of the master's degree

Various understandings of subjects, including teaching methods, create pedagogical differences between learning outcomes, assessment goals and criteria. The paragraph suggests that it is possible to identify two approaches to interdisciplinary teaching. The first approach is "mechanical grouping". Here, two or more teachers with different subject experiences present it from different perspectives to create a more complete picture of the problem. The second approach is "systematic monopoly or dominance". Here, teachers in one subject expand their experience to issues traditionally attributed to other subjects.

The third paragraph of Chapter II is called *"Interdisciplinary research and knowledge. A new method of integration and synthesis of knowledge"*. It is noted that although interdisciplinary research requires more time, imagination and financial resources than single subject research, it can be important for society in terms of creating a perfect knowledge base and helping to solve complex social problems. The paragraph presents the defense of interdisciplinary knowledge, or research. In our opinion, this degree of coherence of interdisciplinary research and knowledge is due to the following reasons: 1) creativity often requires interdisciplinary knowledge; 2) in multinational societies, different ethnic groups can make significant contribu-

tions to social progress and multicultural development; 3) disciplinarians often make mistakes that can be detected by researchers familiar with two or more disciplines; 4) some valuable research topics are overlooked in the "gaps" of traditional disciplines; 5) many intellectual, social and practical problems such as "climate change", "poverty", "ethnic conflicts" require an interdisciplinary approach; 6) interdisciplinary research and knowledge restore the ideal unity of knowledge; 7) interdisciplinary studies are more flexible; 8) in contrast to narrow disciplinarians, interdisciplinarians present themselves as the intellectual equivalent of travel to new "territories"; 9) interdisciplinarians have the potential to break the communication gaps that exist in modern educational institutions, thereby mobilizing its vast intellectual resources for greater social rationality and justice; 10) by bridging between individual disciplines, interdisciplinarians can play a major role in maintaining academic freedom.[15]

Interdisciplinary research can be within the social, humanities, or between the social, humanities, natural, and biological sciences. They are divided into the following types:

- research aimed at the development of expertise and competence in academic disciplines. For example, through developments in the methodology that allow solving new problems or forming new disciplines or sub-disciplines;

- research focused on solving problems of a social, technical or political nature, concentrating on problems and less emphasizing subject-based academic results.

These two models of interdisciplinary research correspond to different types of research questions and require different combinations of research expertise.

It is brought to mind that a new trend is being observed in the world educational space. It is very useful to consider two new methods of knowledge production in order to understand the dynamics of their potential impact on the existing boundaries of interdis-

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[15]Nissani M. Ten Cheers for Interdisciplinarity: The Case for Interdisciplinarity Knowledge and Research. The Social Science Journal, 1997, 34 (2), p. 201-216.

ciplinary research between the state, education, universities, scientific sectors, the humanities and social sciences. It is divided into the traditional method of knowledge production (method 1) and the so-called "service university" (method 2), which is currently formed.

The following features of the "2nd method" of knowledge production have been identified: 1) application content, 2) interdisciplinary and transdisciplinary, 3) diversity of areas where knowledge is produced, 4) High reflexivity resulting from the replacement of "neutral view" with "multiple views" and 5) new forms of quality control.

Chapter III of the dissertation is called **"The philosophical paradigm of interdisciplinary higher education"**. In the first paragraph of this chapter entitled ***"Philosophy as an interdisciplinary field and philosophy of interdisciplinarity. Ontological interdisciplinarity"***, it is noted that despite the fact that multi-, inter - and transdisciplinarity was actively studied by scientists, philosophers were excluded from this work for a long time. Of course, there were no fewer exceptions. In this context, the clarification of philosophy as an interdisciplinary science and as a philosophy of interdisciplinarity are among the most important problems.

It is determined that interdisciplinarity has two different meanings in the field of philosophy. On the one hand, as a new subject area, for example, in science - the subject "philosophy of science", and in biology - as the subject "philosophy of biology". On the other hand, interdisciplinary can be considered as a more fundamental problem for philosophy itself: organizational formation seeks to solve problems in terms of self-understanding and self-conceptualization of philosophy as an academic subject, including academic careers, course programs, and teaching methods.

Philosophy as an interdisciplinary field begins with questioning the academic status of philosophy as a subject, including its famous specializations, methodological approaches and interests. New approaches, organizational forms of philosophical practices and their common goal attempt to apply philosophy to inter - and trans-disiplinary cooperation. Philosophy as an interdisciplinary field

requires intensive and obvious interaction with the objective world. It emphasizes the issues that make up philosophy in the 20th century and overcomes or violates the boundaries of the subject.

According to this definition of "interdisciplinary", philosophers must periodically go beyond their fields and enter other areas of knowledge and society, integrate their work with scientists, engineers and politicians. We combine abstract problems of philosophy with specific interdisciplinary research techniques. Abstract problems show what good social research involves, substantiate why we conduct research, correlate moral and political values with research, and shape and control ethical research behavior.

Alternative approaches are broad conceptual frameworks implemented by researchers. There are different approaches. The ontological and epistemological positions of research traditions form the basis for the toughest debates and debates in modern social sciences. Each of the parties claims that the method of thinking put forward by them determines the means for gaining knowledge about social phenomena, and each side considers the efforts of the other side to be erroneous at best.

When conducting research in the field of interdisciplinary research, we make assumptions about what we will learn and their place in life. The two main positions in ontology are realist and nominalist concepts. Realists see the world from the "outside". The world is organized into pre-existing categories. Those who want to know the world must know those categories. Realists believe that the "real world" exists regardless of people and their interpretations. This allows you to evaluate what is easier in real life.

Some realists, such as critical realists, change this opinion. They claim that it is not easy to "capture" reality directly, and that our study of reality from "outside" can be easily distorted or misled. Our preconceived ideas, subjectivity, or cultural interpretations damage our relationship to reality. Critical realists take some precautionary measures to control the effects of such comments.

Nominalists, on the contrary, believe that people have never directly faced reality from the "outside". Our experience with the

concept, which we call the "real world", has always occurred through the prism of interpretations and internal subjectivity. Subjective-cultural ideas affect what we see and how we perceive reality, how we use it. Our personal biography and cultural worldview always organize our personal experiences by categories and models.

In our opinion, the issues of being and knowledge form the core of interdisciplinarity. The question of being adds another dimension to interdisciplinary theory and practice. An interdisciplinary approach to complex problems requires multiple perspectives derived from different disciplines, teachings, ideologies, and beliefs. Special attention here is paid to the relationship between awareness and reality. This relationship has been studied in the framework of numerous contexts through the teachings of the East and the West, the theory of evolution and the history of cognitive philosophy. The nature of consciousness prepares the foundations for integrative experiences.

Thus, being refers not only to existence, but also to the relationship of human consciousness with the structure of reality. In our opinion, the interdisciplinary approach is a successful step towards resolving potential contradictions that exist between ontology and epistemology.

The second paragraph of Chapter III is called *"Cognitive and constructive foundations of interdisciplinary cognition. Epistemological interdisciplinarity"*. This section takes into account that the preparation of people for an informed and comprehensive life in a dynamic knowledge and information society requires the cultivation of cognitions that synthesize work. We need to develop the ability to combine people's knowledge from a wide and diverse range of sources into a single knowledge in order to solve cultural and natural survival problems.

Synthesis is the main skill of human. This skill manifests itself from an early age, when children play symbolic games, create artistic compositions or learn the rules of a new game. This skill manifests itself from an early age, when children play symbolic games, create artistic compositions or learn the rules of a new game. We quickly

enough learn to synthesize, in a sense, by participating in a society where analogies, rich visual imaginations and simple systems exist.

Today, interdisciplinary claims have been clearly expressed in the missions of most universities. If we want to develop quality guidelines and enable students to implement institutional aspects, we need to take it as normal for them to understand that synthesis is necessary. Since syntheses differ from each other, the study of the epistemological foundations of syntheses requires attention to both the unique, general features of interdisciplinary synthesis and the specific criteria that accompany it.

However, we have little knowledge of the cognitive mechanisms or epistemological basis. In order to bridge this gap, it is necessary to start from interdisciplinary integration as the basic, polymorphic aspect of interdisciplinary education and teaching and gradually move towards the establishment of epistemological foundations of interdisciplinary cognition. Then, the results of the guidelines arising from the epistemological approach should be adapted to the interdisciplinary learning process.

Pragmatic constructive epistemiological framework for interdisciplinary was considered. The productive epistemiological framework for interdisciplinary training consists of the following parts:

- the epistemological framework should be pluralistic in taking into account multiple skill forms of disciplinary concepts and encompass different intellectual routines.

- it must comply with the rules of interdisciplinary teaching and training, illuminate the processes of interdisciplinary integration.

- epistemological theory should clarify the progress of knowledge from simple to more perfect conditions and illuminate the significant dynamics of education.

- finally, it must offer the assurance of the quality of knowledge: epistemiological mechanisms that reduce the likelihood of errors should be established by proposing reliable and appropriate application standards in interdisciplinary efforts.

This process should move towards a dynamic description of interdisciplinary teaching. For the epistemology of interdisciplinary

teaching-training, the above criteria directly point to pragmatic constructivism. In this paragraph, pragmatic constructivism is proposed as the epistemological foundations of interdisciplinary teaching. That approach considers appropriate framework for characterizing purposeful, pluralistic, temporary and long-term interdisciplinary education. Interdisciplinary teaching-training belongs to constructivist-pragmatic epistemology. This epistemology elucidates how people better understand the world, themselves, and others through existing disciplinary imaginaries.

In our opinion, creativity in an interdisciplinary constructive approach involves at least four outcomes. Firstly, since creativity is everywhere, it cannot be a criterion for distinguishing creative subjects (architecture, description and performance-perfomance art, design) from non-creative subjects (crafts, engineering, history). This conclusion is true for specialized disciplines (industrial design, chemical engineering), including a cluster of disciplines (art, science).

Secondly, creativity points to criteria that are more suitable for distinguishing disciplines.

Thirdly, since creativity is comprehensive, there is every reason to expect its presence in interdisciplinary thought and practice. For this reason, there is no reason either to show interdisciplinarity as a lack of creativity, or to praise it for having unique cultural forms.

Fourth, understanding disciplines as artifacts also provides a basis for disciplinary creativity. When the "silos - storage warehouse" model of disciplines is abandoned, interdisciplinarity becomes a strong candidate for the creation of new forms of method and management. This is a fundamental basis for the initial understanding of creativity and interdisciplinarity.

The third paragraph of Chapter III is entitled ***"Instilling of interdisciplinary critical thinking skills in higher education"***.

Interdisciplinary thinking skills and habits (IDTSH) have been defined based on different pedagogical methods for bachelor's and masters. It is noted that the production and training of desirable disciplinary skills and habits has long been carried out within the framework of the pedagogy of repetition and mechanical memorization.

Since the content of the discipline and the interdisciplinary process are unconditionally important, more attention should be paid to what interdisciplinary thinking skills and habits are instilled in the education of students interested in educational and learning results and how successful they are in this work.

The importance of training and teaching for interdisciplinary thinking (IDT) is emphasized in this paragraph. The training-teaching of IDT is very important for higher education, because students must be able to integrate knowledge from different disciplines. Teachers, researchers and university management structures and employees should work in various interdisciplinary teams. For this reason, they should be able to understand the indiscipline knowledge and integrate the indiscipline knowledge in cooperation with individual individuals and groups.

The main goal of IDT is the integration of disciplinary knowledge, but other cognitive activities are also important in terms of critical evaluation of disciplinary knowledge and transition between disciplinary perspectives. As a disciplinary mindset, IDT teaching should be started as early as possible in the curriculum so that students are accustomed to thinking outside the scope of disciplines and are ready to work towards solving complex social problems (e.g. water supply, dispute resolution, climate change, stability, marine resources maintenance).

IDT or interdisciplinary comprehension is defined as: IDT is the ability to integrate knowledge and thinking into defined practice areas of two or more subjects in order to provide cognitive development through a single subject, with little likelihood possible, but using methods and techniques of many subjects, such as explaining an event, solving a problem, or creating a new product or meaning. There are two types of IDT. One is the narrow IDT, which deals with the integration of subject knowledge within a single subject. The other concerns the interdisciplinary integration of subject knowledge.

A potential pedagogical tool required for pedagogical support is the constructive adaptation of teaching-training theory. The two main principles of preparation of this theory are as follows: a) result-

based, and b) constructively adapted (a more detailed explanation of these principles is given in paragraph 4 of Chapter I).

In the context of interdisciplinary higher education, the sub-skills and knowledge that make up interdisciplinary thinking are systematized. Five sub-skills, divided into two categories, are considered important for understanding interdisciplinary thinking. The first category, availability of knowledge, consists of three sub-skills: subject knowledge, knowledge of disciplinary paradigms and knowledge of interdisciplinarity. These sub-skills emphasize the importance of disciplinary declarative, procedural and paradigmatic knowledge as characteristics of natural and social scientific theories. The acquisition of this type of knowledge is required for students to go beyond disciplinary theories and techniques in order to establish relationships between disciplines, identify interdisciplinary contradictions, and consider opportunities for meta-level integration.

Another category consists of high-level skills and communication skills. High-level skills identify the skills needed to search, identify, understand, evaluate, coordinate, and integrate theories and methods of different disciplines, and to apply cognitive development outcomes in conjunction with continuous assessment.

Chapter IV of the dissertation, called **"Didactics of interdisciplinary higher education and training"**, consists of three paragraphs. The first paragraph of the chapter entitled *"Curriculum and didactic concepts of interdisciplinary higher education and training"* describes the curricular and didactic paradigms of interdisciplinary teaching and training. It is shown that despite the widespread use of interdisciplinary approaches in education at present, interdisciplinarity is not implemented in the same way everywhere. Two concepts of interdisciplinarity in higher education were analyzed in detail, taking the perspectives of socio-historical and cultural approaches. The first is the Anglo-Saxon and American approach based on the concept of curriculum. The second is the western European approach based on the concept of didactics.

The first concept promotes the functional, pragmatic and utilitarian concept of interdisciplinary. This approach emphasizes the

importance of pedagogical techniques and methods for education. Thus, it contributes more to the learning process, seeks to solve social problems, issues and events related to real life. The second concept further emphasizes the issue of epistemology, the meaning of interaction between disciplines and, thus, the need to acquire knowledge in the subject.

In fact, these two approaches effectively combine active and flexible forms and objectives of interdisciplinary work with cognitive content. In the culture of education, the course, training, program and curriculum are important concepts. North American universities have a predetermined course structure. This is the curriculum that determines the content of the course and controls the choice of training methods. This type of curriculum structure did not exist in the traditional way in Europe. Only at the end of the 20th century it was applied in universities in European countries to a limited extent.

The attitude to the curriculum tradition was expressed in European, German and Scandinavian countries, taking advantage of the terms "didactics" and "general didactics". In other words, despite the existence of the term "curriculum", most European countries used the term "didactics" in various senses instead.

The main goal of the curriculum is to determine the best methods, methods of transferring knowledge after its accumulation. The goal of American curriculum theory is to give coherence to the conceptual structuring that answers the "what should we teach?" question. Such an opinion is especially emphasized that didactics and pedagogical approaches differ. For this reason, subject didactics differs, at least, in two directions: in terms of pedagogy and in terms of basic academic disciplines. It is based on a common conceptual framework widely shared by the didactics community, including transposition (displacement), devolution (decentralization), theory of didactic situations, reference practices, tripolar model, and others. For example, didactics adopt a common reference model known as a "didactic system".

The second paragraph of the fourth chapter is entitled ***"Problems and features of problem-oriented interdisciplinary higher education and training"***. In this paragraph, the characteristic features of

problem and problem-oriented interdisciplinary training and teaching are clarified. It is shown that after the discussion of interdisciplinarity, the concept of "problem" plays a key role. Interdisciplinarity is considered as a focused approach to a problem beyond the boundaries of a subject or disciplines. However, the reference to the concept of "problem" is not very specific. Problems can be found in traditional scientific disciplines as well as in everyday life.

It is shown that some scholars characterize interdisciplinary research according to its approach to the problem: interdisciplinarity is the joint problem solving between science, technology and society. Similarly, the concept of "transdisciplinarity" implies a type of research and science that overcomes discipline orientation with problem orientation. Our goal is to support and advance the theory about the conceptual foundations of problem-oriented interdisciplinarity by finding a demarcation line between interdisciplinarity and its types. The terms "problem", "problem-oriented interdisciplinarity" and "problem-oriented interdisciplinary training and teaching" (POTT) were clarified in the dissertation.

It is shown that problem-oriented teaching-training (POTT) is a method of teaching for students in which the teaching is created in the context of the original and real problem. POTT was originally created out of training needs to help medical university students understand their basic scientific knowledge. At the same time, it has become more sustainable by helping to develop clinical skills. Although POTT solved this particular problem, it was also based on educational theories and paradigms. POTT's initial assumption is very simple: "as we solve the many problems we face every day, we learn". Although this view is clear, this hypothesis contradicts the formal public education system.

POTT initiators claim that "all life is about problem solving". If this is true, then educational life consists of teaching opportunities. In addition to the importance of lifelong learning, POTT entrepreneurs identify the focus of their problems in teaching. That is, teaching is authentic, but poorly structured, stems from a problem. Poorly structured problems are those that have few or unknown

goals, solutions, and criteria. In POTT-based classes, students review the problem before learning it. This approach is based on centuries of formal educational experience, where students are expected to "master" the content without even considering the problem and trying to give it a content.

The primary features of the POTT teaching environment are:

- Problem-centered teaching-training: students begin learning by applying authentic, poorly structured problem simulations. The content and skills to be learned are organized around problems rather than a hierarchical list of topics. Knowledge is studied in the context of the problem and there is a relationship between knowledge and the problem. The factor that motivates the construction of knowledge is the problem, and that knowledge is re-applied to the problem.

- Student-centered teaching-training: faculty does not dictate teaching activities, but plays a supportive role.

- Self-directed teaching-training: students are responsible for the organization and implementation of teaching and learning issues and processes through self-assessment and individual and peer collaboration, and gain access to their own hands-on knowledge and teaching materials. Necessary assignments are rarely given.

- Teaching and training reflecting oneself (one's own image): students test their understanding and learn to adapt teaching strategies.

- Stimulating teaching-training: trainers are organizers who support and model thinking processes, stimulate group processes and interpersonal dynamics, test students' knowledge in depth, but do not apply content or answer questions directly (not formal speakers).

The theoretical basis of problem-oriented teaching-training is explained in detail in the paragraph. In particular, the importance of constructivist pedagogy for interdisciplinary teaching is described. It is possible to get detailed information about this from the dissertation.

The third paragraph of Chapter IV entitled *"Problem-oriented interdisciplinary higher education and pedagogical methods of training"* emphasizes that the interaction of interdisciplinary teaching

concepts is closely related to how the student builds knowledge in complex situations. Interdisciplinary teaching violates the principles of traditional teaching, such as "memorization" or "memorization of dry facts". By offering higher epistemiologies instead, it enables students to deal with complex and unstructured areas of knowledge. Later, when students are subjected to interdisciplinary training, they are offered more advanced epistemological concepts, improved critical thinking and metacognitive skills, as well as an understanding of the relationship between perspectives obtained from different disciplines.

Accordingly, the purpose of interdisciplinary teaching is to consider not only what the student has learned, but also how she/he has learned. Thus, the idea of complexity is brought to the learning process. This orientation is further plagued by the use of pedagogical techniques through various observation categories and similar terminology of these categories. However, despite the fact that subjects are involved in interdisciplinary teaching, they cannot be considered as part of "from difficult to easy" teaching. Alternatives must be sought in this matter. One of the alternatives is to focus pedagogical attention on students' knowledge, including reflexivity. As a result, several key pedagogical objectives have been identified for interdisciplinary education: building knowledge in a more individual way; emphasis on coping with difficult tasks; search for multiple solutions to the problem; focusing on discovering connections between ideas; interpretation and application of knowledge among several contexts.

Problem-oriented education (POE) can be a turning point in the pedagogical approach in terms of solving real problems as a basis for interdisciplinary teaching. POE can be organized in different curricula (syllabuses), curriculum structures. However, it is important that there is a general consensus on some overlapping principles.

Thus, problem-oriented interdisciplinary education:

- puts complex and real problems at the center of the educational process;

- the constructivist paradigm affirms that knowledge is built by the student through his active participation in a particular problem;

- student-centered; assumes that students are independent and agile;

- supports students in terms of critical thinking;

- envisages a change in the role of the teacher, administrative-manager to the role of supervisor and assistant of the educational process (facilitator, moderator mentor), director of education (manager, tutor, coordinator, etc.);

- based on students' teamwork and teaching skills and habits; this requires the development of team and communication skills;

- helps students develop their cognitive and metacognitive skills by focusing not only on the academic product but also on the academic learning process.

The fourth paragraph of Chapter IV entitled *"Experimental work on the perception of the interdisciplinary higher education paradigm of university teachers and students: statistical-quantitative analysis of the results of the questionnaire survey",* is devoted to the statistical-quantitative analysis of the results of the experimental work - the survey conducted in order to study the perception of the interdisciplinary higher education paradigm by the professors-teachers and students in the higher schools of Azerbaijan. Taking into account that the subject of this experimental study – interdisciplinary education is a new phenomenon in the educational environment of Azerbaijan, data analysis is related to pilot-exploratory research.

The research was conducted with the participation of 120 teachers and 90 students studying Bachelor, Master and Doctoral degrees in three randomly selected universities (Baku State University, Baku Slavic University and Azerbaijan State Pedagogical University) in order to learn the opinion of the respondents about the "interdisciplinary", which is distinguished for its novelty and at the same time its importance in the.

The analysis of the results of both questionnaires is given below separately. I. We present the results of university teachers. The questionnaires were presented to the respondents by professional interviewers in different faculties of all three universities, and all the

questionnaires answered by the end of January 2021 were collected and analyzed. The SPSS (Statistical Package for the Social Sciences) program was used for the statistical-quantitative analysis of the data (respondents' answers / information).

The reason for preferring to use the SPSS program is mainly due to the fact that the program is specifically designed for the social sciences and practical social research. More precisely, it allows the use of all statistical analysis models of the program. At the same time, it is a program with a simple and affordable working mechanism. Three stages of work were carried out to analyze the questions in the questionnaire and the information obtained with SPSS: coding of survey questions and potential answer options, inclusion of data (respondents' answers/data) into program in accordance with coding, conducting analysis. After the analysis, the individual "result-product volume" (output) page was corrected with tables and diagrams, and the information and indicators to be reflected in the tables and diagrams were identified. At the same time, using the capabilities of the "chart editor" window, the diagrams were designed in an appropriate form.

In accordance with the purpose of the research, descriptive-statistical analysis was preferred, the opinion of the respondents on each question was specified and given in the form of tables and diagrams. 53 of the respondents were teachers of Baku State University, 35 of Baku Slavic University and 32 of Azerbaijan State Pedagogical University. 58 teachers, 26 senior teachers, 32 associate professors and 4 professors, 66.6 percent of respondents see interdissiplinarity as "cognitive progress, new knowledge and product creation". 81.6% of respondents consider the field of study as the main application area of interdissiplinarity.

The main result that respondents expect from the "teaching of the subject" is to develop creative thinking in students. At the same time, 48.3 percent of surveyed teachers perceive interdissiplinity as a largely new parade. They consider "changes in general education" as the main motive for expansion of interdisciplinary education. Hence, the basis is given to conclude that making appropriate changes in education in the opinion of respondents is important for the application of

interdisciplinary. Teachers were not satisfied only with the integration and synthesis of subjects during the study, and tried to apply interdisciplinary approach and its application in their dissertation (45.8 percent expressed their full confidence in this).

Two questionnaires were conducted among university teachers and students in order to test the theoretical results obtained in the research work. The respondents ' answers were studied by quantitative (statistical) analysis method, on the basis of which a number of discussions on practical proposals and promising directions on the development of interdisciplinary scientific and didactic knowledge for higher education in our universities, seminars consisting of focus groups and experts were proposed to be organized. In particular, the following practical proposals were recommended for the implementation and implementation of interdisciplinary higher education in higher schools:

- inclusion of interdisciplinary higher education, teaching and learning in a single general integrative university curriculum;

- identification and enumeration of interdisciplinary subjects studied at our university as a model of interdisciplinary education; sequence of courses and specialties, compulsory or elective, credit or non-credit, etc. should be clearly stated;

- as a practical model, taking into account the breadth and depth of knowledge in the teaching and learning of higher education;

- we suggest that modern university education should be organized from two types of interdisciplinary subjects: (a) comprehensive education and training; (b) teaching-training aimed at the integration and synthesis of breadth and depth;

- the first type of education (interdisciplinary subjects that provide extensive knowledge at the university) is taught at the undergraduate level by teams of university teachers; the second type of education (interdisciplinary basic subjects) must consist of compulsory humanitarian subjects to be taught in the 1st year;

- interdisciplinary university graduates should have extensive and in-depth knowledge at the junction of disciplines, be able to cri-

tically analyze, composition and evaluate the knowledge gained from the interaction, relationship and mutual hybridization of two or more disciplines;

- interdisciplinary scientific research should become a strategic component of university education and training.

- we propose the establishment of the following structures and institutes in universities and academia to organize the research, training and teaching of interdisciplinary higher education and knowledge: organization of "interdisciplinary practical seminar courses" to ensure transition of students,professors, teachers and management structures to interdisciplinary education; "organization of interdisciplinary departments and courses under university faculties"; "awarding interdisciplinary bachelor's, master's and doctoral degrees"; "awarding interdisciplinary main specialties and auxiliary specialties and diplomas" (for example, the main specialty - international relations, the auxiliary specialty - political history); establishment of interdisciplinary teaching-training lectures and seminar courses between faculties; organization of teams of teachers who have passed the "interdisciplinary training and assessment course" at the university center or TI, as well as by international educational centers; writing interdisciplinary course and diploma works, preparation of interdisciplinary doctoral and doctoral degrees; development of interdisciplinary programs and curricula, textbooks and teaching aids; it is planned to establish and develop relations with existing interdisciplinary universities, academies, research and teaching centers, institutes, governmental and non-governmental organizations in the United States, Canada, Australia, the EU, CIS countries and Türkiye.

The following **results** were obtained regarding the research:

The system approach in research is built on different levels. It is important to mention at least two levels. First, the systems approach structures the integrity of the interdisciplinary phenomenon and strategies investigated in the research work at the level of methodological principles. Secondly, the systems approach clarifies interdisciplinarity itself as a new system creation. Thus, at the first level there is a general system, and at the second level there is a special

system approach, or, to put it simply, the interactions and relationships of systems and sub-systems. In the conceptual structure (framework) of the research work, man as a general system, or "anthropic" system at the level of macro - and micro-worlds, in the context of the complexity of the subsystems "man-nature", "man-society", "man-science", "man-technology", which include human participation, existence and activity in both worlds, have been studied as the object and subject of pedagogical and didactic analysis.

The structure of the interdisciplinary paradigm of higher education consists of the following main elements: interdisciplinary, multidisciplinary and transdisciplinary. Some researchers add the concepts of crossdisciplinary, pluridisciplinary, intradisciplinary (intradisciplinary) to the continuum of interdisciplinary higher education.

The paradigm of interdisciplinary education is the study of complex problems of reality that cannot be solved from the perspective of a single subject, integrating and synthesizing perspectives, concepts, methods, ideas, worldviews and principles of a scientific approach of at least two or more subjects in order to solve them, creating a new product and a new field of knowledge.

The formation of a more complete understanding in students involves the creation of interdisciplinary training and teaching courses, syllabuses, programs, methodical andasites and curricula to develop critical thinking abilities, their interdisciplinary thinking style, competencies, skills and habits related to problem solving.

The typology of interdisciplinary higher education approaches plays an important role in the theoretical and practical analysis of complex phenomena. From the definitions we considered above, we come to the conclusion that the differences between interdisciplinary and multidisciplinary have a greater impact by involving a combination of discipline components, a broad synthetic attempt at interdisciplinary interaction. In our opinion, the concept of interdisciplinary, having this special meaning, is also a general comprehensive worldview and educational concept. As an interdisciplinary universal category, it includes the types of activities that confront, cross, apply,

combine, synthesize and integrate two or more disciplines or integrate parts beyond the boundaries of a single discipline.

According to our conclusion, the transdisciplinary form of higher education is the stage of the highest coodination of the interdisciplinary worldview. It combines five main concepts - an interdisciplinary approach (worldview), disciplines, integration, synthesis and new levels of understanding the nature of reality. Thus, interdisciplinarity is understood not simply as an approach, but as a methodology of multiple (polyparadigmatic) different approaches that overcome and combine dominant disciplinary approaches.

The essence of the interdisciplinary new system in research work is clarified by the categories of integration and synthesis. Integration and synthesis categories have a great role in the formation of a new system. In the research paper, integration is given a very concise definition. It means to unite or integrate into a functional whole. As a result, interdisciplinary integration is the activity of combining ideas and knowledge with critical evaluation and creativity to create a new integrity or whole and the advancement of cognition. A synonym for integration is "synthesis". Synthesis involves the creation of an interdisciplinary result as a result of integrative activities. The characteristics of these "integrative activities" or steps are manifested in the process of integration and synthesis.

Another conclusion we have reached is that at least two cognitive activities are involved in the integration process: (a) perspective point of view and (B) integrated thinking perspective. Perspective view involves looking at some problem, object, or phenomenon from a specific dimension or point of view other than their own. When applied to interdisciplinary work, perspective view involves examining a problem from the perspective of two or more disciplines and identifying differences between them.

Thus, the main elements of a perspective view in the process of interdisciplinary integration are the following:

- Students should avoid biased statements derived from subject and individual thinking

- Students must act as subject experts as they master each subject for concepts related to the problem
- Students should not limit their research to only subjects they know or concepts or theories they are familiar with.

The second cognitive ability required for integrative work is the system-thinking skill, a more fully discussed interdisciplinary thinking ability. This is the competence to understand how ideas and information from relevant disciplines relate to each other and to the problem.

The main content, scientific ideas and results of the dissertation are reflected in the following scientific works of the applicant:

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