

A transdisciplinary approach to teaching and building a higher education system

Un enfoque transdisciplinario para la enseñanza y la construcción de un sistema de educación superior

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Abstract

Transdisciplinarity in higher education involves the formation of competence that enables the practical use of acquired knowledge, skills, and abilities from various disciplines in order to solve applied problems. The purpose of the academic paper lies in highlighting the features of using the transdisciplinary approach in the modern system of higher education. The present research is based on the transdisciplinarity concept as a way of solving complex social

problems due to the properties and competencies of the individual to use knowledge, skills and abilities for solving complex problems. Results. Transdisciplinarity (TD) in the system of higher education is manifested as a form of education that ensures the formation of competence in specialists for solving complex problems based on a holistic approach and knowledge that is on the border of different disciplines. It has been revealed that TD is a new form of problem solving due to the specialist's transdisciplinary knowledge and his competence to apply it to the existing problem in the subject area. Thus, transdisciplinarity in higher education is the formation of knowledge, skills and abilities in order to find a way for solving complex social problems. Higher educational institutions form transdisciplinary competence as a personal quality.

Key words: transdisciplinarity, higher education system, transdisciplinary competence, specialists' competencies.

Resumen

Para superar con éxito los desafíos de un entorno externo dinámico, los especialistas de diversas esferas de la vida deben poseer un conjunto ampliado de competencias y un alto nivel de flexibilidad. La transdisciplinariedad en la educación superior implica la formación de competencias que permitan el uso práctico de los conocimientos, habilidades y destrezas adquiridos en diversas disciplinas para resolver problemas aplicados. El propósito del artículo académico radica en resaltar las características del uso del enfoque transdisciplinario en el sistema moderno de educación superior. La presente investigación se basa en el concepto de transdisciplinariedad como forma de solución de problemas sociales complejos debido a las propiedades y competencias del individuo para utilizar conocimientos, habilidades y destrezas para la solución de problemas complejos. El método de análisis de contenido se ha utilizado en el curso de la investigación con el fin de estudiar cualitativamente el concepto de transdisciplinariedad del sistema de educación superior. Resultados. La transdisciplinariedad (TD) en el sistema de educación superior se manifiesta como una forma de educación que asegura la formación de competencias en especialistas para la solución de problemas complejos a partir de un enfoque holístico y de conocimientos que se encuentran en la frontera de diferentes disciplinas. Se ha revelado que el TD es una nueva forma de resolución de problemas debido al conocimiento transdisciplinario del especialista y su competencia para aplicarlo al problema existente en el área temática. Así, la transdisciplinariedad en la educación superior es la formación de conocimientos, habilidades y destrezas con el fin de encontrar el camino para la solución de problemas sociales complejos. Las instituciones de educación superior forman la competencia transdisciplinar como una cualidad personal.

Palabras clave: transdisciplinariedad, sistema de educación superior, competencia transdisciplinar, competencias de los especialistas.

1. Introduction

In order to successfully overcome the challenges of a dynamic external environment, specialists from various spheres of life should possess an expanded set of competencies

and a high level of flexibility. In addition to experience and knowledge in the professional field, specialists should develop personal, creative, systemic, social-cultural skills in various disciplines with the possibility of their integration in their own activities. Such necessity arises in accordance with the goals of sustainable development, the emergence of complex problems requiring knowledge, abilities, skills from various disciplines (Risopoulos-Pichler, Daghofer & Steiner, 2020). In response to such needs, the transdisciplinary approach is becoming more and more relevant as an integral component of the disciplinary approach, which involves the formation of the skill of adaptation, flexibility of specialists to the changing requirements of professional life, focused on the actualization of internal capabilities (Nicolescu, 2011). Therefore, higher educational institutions should integrate transdisciplinary knowledge into the education system in order to train specialists capable of solving complex problems of sustainable development. The formation of this type of knowledge requires multidimensionality of the educational process and redefining the values of higher education (Nicolescu, 2012). Transdisciplinarity is considered as a competence to ensure sustainability, which specialists develop as a personal skill in the process of undergoing educational programs (Tejedor, Segalàs & Rosas-Casals, 2018).

The purpose of the academic paper lies in highlighting the features of using the transdisciplinary approach in the modern system of higher education.

2. Literature Review

Transdisciplinarity in its various manifestations has gained popularity in higher education as a way to solve complex societal problems (Jia, Wang & Fengting, 2019) by enabling the productive crossing of boundaries between different fields of knowledge and communities of practice (van Baalen, de Groot & Noordegraaf-Eelens, 2021).

Transdisciplinarity is a research strategy that crosses the disciplinary boundaries of different sciences in order to form a complex, holistic approach to problem solving. This refers to investigations focusing on problems that cross the boundaries of two or more disciplines (Battisti, 2018). For instance, this approach is effective when investigating the effectiveness of information systems for conducting biomedical research (bioinformatics), based on concepts or methods that were originally developed within one discipline, but later began to be used by several others. Ethnography, which uses a field research method originally developed in anthropology, can also serve as an example. This research method is also used, for example, in epidemiology. Therefore, the transdisciplinary approach provides scientists with inputs and methods, facilitating a systematic way of solving a problem.

Transdisciplinary education is an education that harmoniously combines various disciplines towards building new knowledge and forming cognitive abilities, stable knowledge and skills in an individual. “Transdisciplinarity” characterizes such studies that go “through”, “across” disciplinary boundaries; they go “beyond” specific disciplines. Joint

research projects are called the transdisciplinary ones (Muller & Flohr, 2016). Transdisciplinarity in science is a higher stage of research, which is not limited to interdisciplinary connections, but transfers them to the middle of the global system, without strict boundaries between disciplines. This is the way the principle of scientific research was designated, which describes programs of a scientific approach towards problems going (transcending) beyond the boundaries of established academic disciplines. This process also occurs in accordance with the growth in the number and spread of the influence of convergent technologies. Mastering the ideology of transdisciplinarity should mean the ability to implement such research strategies that take into account the multi-level and complexity of reality, know how not to oppose, but to introduce the complementarity principle. Needless to say, this requires certain thinking skills, the use of cognitive techniques on the part of researchers (Christensen et al., 2006).

In the second meaning, transdisciplinarity is understood as a personal property, the competence of a “generalist”, and is interpreted as a high level of versatility, universality of knowledge of a specific person. Let us emphasize the obvious importance of educational technologies in this personalized direction of transdisciplinarity. It can be immediately noted that the task of higher education can be considered the formation of a personality with such integrative skills and competencies.

Table 1.

Five examples of how TD is conceptualized

Author	Paper category	TD concept
Muller & Flohr (2016)	Paper reviewed academic paper (case study)	TD use for describe the effort to achieve deeper understanding and cooperation in addressing problem situation within complex system. TD essentially concerns the articulation between disciplines, rather than their relations, as is the case with pluri and interdisciplinary.
Shin et al. (2006)	Conference paper (case study)	TD is defined as new form of learning and problem solving involving cooperation among different part of society and academia in order to meet complex challenges
Hugill & Smith (2013)	Peer-reviewed academic paper (case study)	TD is between disciplines across the different disciplines and beyond all disciplines. It encourage an active engagement with real-world problem, a transformative practice and a constructive approach to problem-solving
Al-Hagla (2012)	Peer-reviewed academic paper (case study)	Four features od TD: it develops a distinct but evolving framework to guide problem-solving efforts; the solutions involve movement in many directions; theoretical and empirical work; the diffusion and dissemination of new knowledge to participants that take place through rather than after this process; it is dynamic and constantly evolving.
Stenberg & Fryk (2012)	Peer-reviewed academic paper (case study)	TD implied that all actors – professionals working in the academic, public and private sectors as well as members of civil society – are considered knowledge producers, bearers, and users.

Source: Van Baalen, De Groot & Noordegraaf-Eelens (2021).

Balsiger (2015) proposes four types of transdisciplinarity (soft, hard, inclusive and reflexive) in order to identify ways for moving from one type to another in changing circumstances towards ensuring the collaboration of interested parties and knowledge integration opportunities. Hampson, Gregor & Assenza (2013) have integrated the advanced concepts of complexity, integration, resilience, and deep learning (including intersectoral learning). The latter concept (that is, deep, intersectoral learning) has inspired and contributed to the emergence of transdisciplinarity, the creation of “new, small, adaptive “interspaces” between higher education and other sectors of the society”. McGregor & Volckmann (2013) argue that transdisciplinarity is the best way to create interdisciplinary spaces to enable deep, intersectoral learning and deep, complex, integrative knowledge generation in order to address the challenges facing humanity in the XXI century (McGregor & Volckmann, 2013).

3. Methodology

The present research is based on the transdisciplinarity concept proposed in the scientific works of Shin et al., (2006), van Baalen, de Groot & Noordegraaf-Eelens (2021), who define TD “as a new form of learning and problem solving involving cooperation among different parts of the society and academia in order to meet complex challenges”, a method of solving complex social problems. The interpretation of transdisciplinarity as values of the individual, the person’s competencies has been used in the course of the research (Tejedor, Segalàs & Rosas-Casals, 2018). Such approach has made it possible to reveal the features of using the transdisciplinary approach in the modern system of higher education in Ukraine.

The content analysis method for the qualitative study of the concept of transdisciplinarity of higher education has been used in the course of the research. In order to conduct the analysis, competencies (knowledge, abilities, and skills) have been used, which are enshrined in the National Qualifications Framework of Ukraine in accordance with 5–8 educational and qualification levels (EQL). Content analysis also has made it possible to identify the competencies that are formed in specialists, in accordance with the transdisciplinarity concept. By the way, the present academic paper article analyses the Standards of higher education of Ukraine: first (bachelor’s), second (master’s) and third level (doctor of philosophy degree), in the field of knowledge 05 “Social and behavioural sciences”, speciality 051 “Economics”.

4. Results

In the National Strategy for the Development of Education in Ukraine for 2012-2021, one of the main tasks is the development of standards of higher education, oriented on the competence-based approach, which will be coordinated with the new structure of educational and qualification (educational and scientific) levels of higher education and with the National Framework of Qualifications (NFQ).

In the NFQ, transdisciplinarity is defined as the competence (combination of knowledge, abilities and skills) of a professional, which is formed at 5–8 educational and qualification levels (Table 2). The evidences of using the transdisciplinary approach in the higher education system of Ukraine, in particular, are as follows:

- 1) the introduction of a competence-based approach to learning;
- 2) the determination of a set of knowledge, abilities, skills that should contribute to solving complex problems, problems in specialized areas of professional activity, contribute to the formation of creative solutions, the development of cognitive abilities;
- 3) the determination of integral, general and professional competencies, from among which the following ones are important, namely: critical thinking, communication, the ability to integrate knowledge and solve complex problems in broad or multidisciplinary contexts (the 7th level), critical analysis, evaluation and synthesis of new and complex ideas (the 8th level).

Thus, in the system of higher education of Ukraine, the transdisciplinary approach is used to a greater extent in the course of training of specialists of the 7th and 8th qualification levels, who possess knowledge on the border of disciplines and can generate new knowledge, ideas.

Table 2.

Description of qualification levels and their corresponding competencies of specialists

Level	Knowledge	Skills/Abilities	Communication
5	Comprehensive specialized empirical and theoretical knowledge in the field of study and/or professional activity, awareness of the limits of this knowledge	a wide range of cognitive and practical abilities/skills necessary for solving complex problems in specialized areas of professional activity and/or education; revealing creative solutions or answers to well-defined concrete and abstract problems based on the identification and application of data; planning, analysis, control and evaluation of one's own work and the work of others in a specialized context;	interaction with colleagues, supervisors and clients on issues related to understanding, skills and performance in the professional field and / or in the field of study; conveying one's own understanding, knowledge, judgments, experience to a wide range of people (colleagues, managers, clients), in particular' in the field of professional activity;
6	Conceptual scientific and practical knowledge, critical understanding of theories, principles, methods and concepts in the field of professional activity and/or education	advanced cognitive and practical skills/abilities, mastery and innovation at the level necessary for solving complex specialized tasks and practical problems in the field of professional activity or education	conveying information, ideas, problems, solutions, one's own experience and arguments to specialists and non-specialists, data collection, interpretation and application; communication on

			professional issues, including in a foreign language, orally and in writing;
7	Specialized conceptual knowledge that includes current scientific achievements in the field of professional activity or field of knowledge and is the basis for original thinking and conducting research, critical understanding of problems in the field and at the boundaries of fields of knowledge	specialized skills/problem-solving skills necessary for conducting research and/or carrying out innovative activities in order to develop new knowledge and procedures; the ability to integrate knowledge and solve complex problems in broad or multidisciplinary contexts; the ability to solve problems in new or unfamiliar environments in the presence of incomplete or limited information, taking into account aspects of social and ethical responsibility;	clear and unambiguous presentation of own knowledge, conclusions and arguments to specialists and non-specialists, in particular, to persons who are studying
8	Conceptual and methodological knowledge in the field or on the border of fields of knowledge or professional activity	specialized abilities/skills and methods necessary for solving significant problems in the field of professional activity, science and/or innovation, expansion and reassessment of already existing knowledge and professional practice; initiating, planning, implementing and correcting a consistent process of thorough scientific research with due academic integrity; critical analysis, evaluation and synthesis of new and complex ideas;	free communication on issues related to the field of scientific and expert knowledge with colleagues, the wider scientific community, society as a whole; the use of academic Ukrainian and foreign languages in professional activities and research;

Source: Verkhovna Rada of Ukraine (Resolution of the Cabinet of Ministers of Ukraine No. 1341, 2022).

Competence-based approach is the focus of the educational process on achieving results, which are hierarchically subordinated competencies as follows: key, integral, general and special (professional). The strategy of modernization of the Ukrainian education has laid core competencies (CCs) as the basis of the updated content of education. The main result of the activity of the HEI should be a set of state-declared CCs in the intellectual, social-political, communication, and information spheres. CCs are represented through various universal mental means, tools (ways, methods, techniques) of achieving goals (results) by a person that are significant for him. Every member of the society, to one degree or another, should master the CCs. CCs provide an opportunity for a person to achieve results in uncertain, problematic situations; solve problems independently and in cooperation with others; cope with situations for which there is no complete set of developed tools. The definition and selection of CCs is carried out by consumers of educational outcomes on the basis of sociological research and public discussion and depends on the abilities and qualities that are currently valuable in this

society. In the modern Western society, the normative basis for the selection of CCs is the basic principles of human rights, democratic values and goals related to the sustainable development of CCs, which are manifested and acquired by a person in activities that have value for him.

The standards of higher education contain competencies that determine the specifics of the training of specialists in the speciality 051 “Economics” and learning outcomes that express exactly what a student should know, understand and be able to do after successfully completing the educational program. They are mutually agreed upon and correspond to the descriptors of the National Qualifications Framework. Institutions of higher education independently determine the list of disciplines, practices and other types of educational activities necessary for acquiring the competencies defined by the Standards. The lists of competencies and learning outcomes given in the Standards are not exhaustive. Institutions of higher education may indicate additional competencies and learning outcomes when forming the profile of educational programs (curricula). Teaching and learning involves a combination of lectures, practical and laboratory classes, consultations, independent work on solving applied problems, fulfilment of coursework and projects, performance of bachelor’s qualification work. The ultimate goal of the educational programs is the training of specialists – the possession of modern economic thinking and the relevant competencies necessary for the successful performance of professional duties in the field of economics.

According to the Standard of Vocational Pre-Higher Education, from among the competencies of a specialist, which testify to the use of transdisciplinarity in higher education, the following ones should be highlighted, namely:

- 1) integral as the ability to solve typical specialized tasks and practical problems in the economic sphere or in the learning process;
- 2) general;
- 3) special or professional ones.

As evidenced by the data in Tables 3–5, a higher education and qualification level (EQL) corresponds to a higher level of specialist’s competence.

Table 3.
List of competencies of a professional junior Bachelor in Economics

Competence	Essence
<i>Integral competence</i>	The ability to solve typical specialized tasks and practical problems in the economic sphere or in the learning process, which requires the application of the provisions and methods of economic science, and may be characterized by certain uncertainty of conditions; the ability to bear responsibility for the results of their activities; exercise control over other persons in certain situations.
<i>General competencies</i>	GC 5. The ability to search, process and analyse information from various sources. GC 6. The ability to apply knowledge in practical situations. GC 7. The ability to use information and communication technologies.
<i>Special competencies</i>	SC 1. The ability to identify information and understand the problems of the subject area, the basic principles of the functioning of the modern economy. SC 4. The ability to conduct an economic analysis of the functioning and development of economic entities. SC 5. The ability to plan the activities of economic entities in the conditions of a changing environment. SC 6. The ability to solve professional tasks related to the organization of the activities of individual divisions of economic entities. SC 7. The ability to perform tasks related to the functioning of the management system of economic entities. SC 8. The ability to justify economic decisions based on an understanding of the regularities of economic systems and processes. SC 9. The ability to carry out activities in the interaction of business entities. SK 10. The ability to identify problems and propose ways to solve them during the analysis of specific situations of an economic nature

Source: Ministry of Education and Science of Ukraine (MES, 2022 a).

Integral competence reflects the key goal of training a specialist – the comprehensive solution of complex problems and tasks, which corresponds to the goals of transdisciplinarity in higher education.

Table 4.
List of competencies of a Master's Degree in Economics

Competence	Essence
<i>Integral competence</i>	The ability to identify and solve complex economic tasks and problems, to make appropriate analytical and managerial decisions in the field of economics or in the learning process, which involves conducting research and/or implementing innovations under uncertain conditions and requirements.
<i>General competencies</i>	GC1. The ability to generate new ideas (creativity). GC2. The ability to abstract thinking, analysis and synthesis. GC5. The ability to work in a team. GC6. The ability to develop and manage projects. GC8. The ability to conduct research at the appropriate level.
<i>Special competencies</i>	SC3. The ability to collect, analyse and process statistical data, scientific and analytical materials, which are necessary for solving complex economic problems, to draw reasonable conclusions based on them. SC4. The ability to use modern information technologies, ways and methods of research of economic and social processes, adequate to the established research needs. SC6. The ability to formulate professional tasks in the field of economics and solve them, choosing the appropriate directions and appropriate methods for their solution, taking into account the available resources. SC7. The ability to substantiate management decisions regarding the effective development of economic entities.

Source: Ministry of Education and Science of Ukraine (MES, 2022 b).

Special (professional) competencies include an interdisciplinary approach – the ability to use the provisions and research methods of mathematics, statistics, management, economic analysis, etc. in order to solve problems in various professional spheres of activity and to use information and communication technologies.

Table 5.
List of competencies of a Doctor of Philosophy in Economics

Competence	Essence
<i>Integral competence</i>	The ability to produce new ideas, solve complex problems in the field of economics, as well as conduct one's own scientific research, the results of which have scientific novelty, theoretical and practical significance, which involves a deep rethinking of existing and the creation of new holistic knowledge and/or professional practice.
<i>General competencies</i>	GC01. The ability to abstract thinking, analysis and synthesis. GC02. The ability to search, process and analyse information from various sources. GC03. The ability to work in an international context. GC04. The ability to generate new ideas (creativity). GC05. The ability to solve complex problems of the economy on the basis of a systematic scientific worldview and a general cultural outlook while observing the principles of professional ethics and academic integrity.

**Special
competencies**

SC01. The ability to conduct original research, achieve scientific results that create new knowledge in economics and related interdisciplinary areas, and can be published in leading scientific publications in economics and related fields.

SC03. The ability to use modern methodologies, methods and tools of empirical and theoretical research in the field of economics, computer modelling methods, modern digital technologies, databases and other electronic resources, specialized software in scientific and scientific-pedagogical activities.

SC05. The ability to identify, conduct in-depth analysis and solve problems of a research nature in the field of economics, taking into account economic risks and possible social-economic consequences, to evaluate and ensure the quality of performed research, including on issues of European and Euro-Atlantic integration.

SC06. The ability to substantiate and prepare economic decisions based on an understanding of the patterns of development of social-economic systems and processes using mathematical methods and models.

SC07. The ability to initiate, develop and implement complex scientific projects in the economy and interdisciplinary approaches related to it, to show leadership and responsibility in their implementation; commercialize the results of scientific research and ensure compliance with intellectual property rights.

Source: Ministry of Education and Science of Ukraine (MES, 2022 c).

The framework of problem-solving competencies states that solving complex problems, such as those achieved through innovative business processes, requires a dynamic and holistic interaction of the following factors of professional competence in the field, namely:

- 1) specific knowledge, skills, abilities, and methods (by contrast with the other four dimensions of competence, this focuses on specific disciplines or areas);
- 2) systemic competence, that is, understanding and working with complex processes, events and systems; this includes designing problem-solving processes and choosing the methods to be applied);
- 3) sociocultural competence, that is, the ability to cope with different social and cultural conditions as part of effective processes of communication and interaction between disciplines and between organizations and interested parties;
- 4) personal competence, that is, a person's ability to reflect and develop personally;
- 5) it is also a necessary condition of sociocultural competence; and creative competence, that is, the ability to create new, original solutions for undefined, open problems as a prerequisite for the development of innovation; it goes beyond routine problem solving.

5. Discussion

The conducted research confirms the conclusions that transdisciplinarity in the system of higher education is manifested as a form of education, which ensures the formation of competencies in specialists to solve complex problems based on a holistic approach and knowledge that is on the border of different disciplines. As in the scientific works of Shin

et al., (2006), van Baalen, de Groot & Noordegraaf-Eelens (2021), in the course of the present research, it has been empirically found that TD is a new form of problem solving through the transdisciplinary knowledge of a specialist and his competence to apply them to an existing problem in the subject area. Thus, transdisciplinarity in higher education is the formation of knowledge, skills and abilities in order to find a way to solve complex social problems. Higher educational institutions form transdisciplinary competence as the value of the personality (Tejedor, Segalàs & Rosas-Casals, 2018).

Transdisciplinarity has emerged in response to criticism of the standard set of knowledge in the disciplines of the curricula of HEIs. The problem of using the acquired knowledge in the process of learning in practice is still relevant. This problem especially concerns the using of acquired knowledge from various disciplines for solving issues in professional activity. In the 1970s, for the first time, discussions about such a problem were heard between scientists and practitioners in the process of planning of curricula. In the 1990s, transdisciplinarity is again considered as a relevant approach in higher education for solving new, complex, global problems (climate change and sustainable development, problems in various spheres of the society, including science, technology, and social problems, political, economic). Currently, transdisciplinarity is characterized by a focus on problems that require creative solutions, the involvement of various interested parties and socially responsible science (Bernstein, 2015).

Despite the relevance of transdisciplinarity, single-disciplinary courses still prevail in higher educational institutions (Vienni Baptista & Rojas-Castro, 2020). Exceptions are such interdisciplinary courses as philosophy, planning, which are integrative disciplines. Scientists note that the creation of transdisciplinary teams in practice does not provide a solution to the problem (Max-Neef, 2005). By the way, it is difficult to create a transdisciplinary environment within higher educational institutions (McWilliam, Hearn & Haseman, 2008). This may be due to the fact that transdisciplinarity involves the formation of the skill of adaptation and constant flexibility in specialists, but not every individual has the ability to develop such a skill (Psycharis et al., 2018). The selection of specialists in a transdisciplinary team should include an assessment of adaptability and flexibility, which is currently absent in universities.

Higher education should provide an opportunity to become familiar with transdisciplinary ideology, interdisciplinary methods (Tasdemir & Gazo, 2020). The system of higher education, despite constant reforms, is still quite inert. Consequently, it is obvious that a transdisciplinary approach should provide for the development and formation of skills that are most in demand on the labour market (Hoinle, Roose & Shekhar, 2021), in particular, as follows: system thinking, complex problem solving, creativity, result-oriented teamwork.

Most interdisciplinary initiatives in higher education fit into the discourse of problem solving, where the joint production of knowledge, a proactive approach to learning is relevant (Baumber et al., 2020). In addition, they fit into a scheme of broad collaboration and deep integration (Baumber et al., 2020), which is understood as strict

transdisciplinarity. Within the framework of such a discourse, the experience related to “innovation” fits into the sphere of reflexive transdisciplinarity, which depends to a great extent on the efforts of the subjects of education.

6. Conclusion

Transdisciplinarity in various manifestations has gained popularity in higher education as a way to solve complex social problems. Transdisciplinary education is an education that harmoniously combines various disciplines to build new knowledge, and it forms cognitive abilities, stable knowledge and skills in an individual. The evidences of using a transdisciplinary approach in the higher education system of Ukraine are as follows:

- 1) implementation of a competence-based approach to education;
- 2) determination of a set of knowledge, abilities, skills that should contribute to the solution of complex tasks, problems in specialized areas of professional activity, contribute to the formation of creative solutions, the development of cognitive abilities;
- 3) determination of integral, general and professional competencies, among which the following ones are of a particular importance: critical thinking, communication, ability to integrate knowledge and solve complex problems in broad or multi-disciplinary context (the 7th level), critical analysis, evaluation and synthesis of new and complex ideas (the 8th level).

In the system of higher education of Ukraine, the transdisciplinary approach is used to a greater extent in the training of specialists of the 7th and 8th qualification levels, who possess knowledge on the border of disciplines and can generate new knowledge, ideas.

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