THE TRANSDISCIPLINARY AS AN EDUCATIONAL PARADIGM OF THE FUTURE

Ion Akiri, Dr. Sc., Senior Researcher
Institute of Educational Sciences,
Chișinău, Republic of Moldova
iakiri8@gmail.com
https://orcid.org/0000-0002-8874-232

To cite this article: Akiri, I. (2021). Transdisciplinary as an educational paradigm of the future. Education: Modern Discourses, (4), 33-38.
https://doi.org/10.37472/2617-3107-2021-4-04

Abstract. The paper highlights the problem of transdisciplinarity as an educational paradigm of the future. The necessity of introducing transdisciplinarity into education substantiated. Examples of the implementation of transdisciplinarity at school through STEM / STEAM project activities are given. The experience of the Republic of Moldova in solving this problem is described. Examples of possible ways of integrating school disciplines are given. It is concluded that the introduction of the educational paradigm of transdisciplinarity will effectively contribute to improving the quality of education and the formation / development of key competences.

Keywords: key competence; competences; curriculum; educational paradigm; integration of school disciplines; STEM / STEAM projects; technology; transdisciplinarity.

INTRODUCTION

The Council of the European Union in its Recommendations of 22 May 2018 on key competences for lifelong learning has called on Member States to ensure opportunities for all to develop the following key competences by making full use of the “Key Competences for Lifelong Learning – A European Reference Framework”:

1. Literacy competence;
2. Multilingual competence;
3. Mathematical competence and competence in science, technology, engineering;
4. Digital competence;
5. Personal, social and learning to learn competence;
6. Citizenship competence;
7. Entrepreneurship competence;

As a result of the analysis of the state of affairs in education, in the context of the formation of competencies, according to the recommendations of the European Council, we state that the modern school still does not realize its main goal - the preparation of graduates for an active, conscious life. One of the reasons is the fact that the school teaches students based on the school curriculum, which is monodisciplinary, while life that surrounds us is transdisciplinary. When solving a life task, one should, as a rule, use knowledge not from one area, but from different areas. Unfortunately, the modern school does not sufficiently teach this
approach to its graduates, although in the modern world a modern school must strategically form competencies to study, communicate, work in a team, live (self-determine). It is about the formation of universal educational skills and abilities necessary to solve various problems in real and / or simulated situations. This approach requires a higher level of interaction between the content of academic disciplines. Therefore, a more effective educational paradigm needs to be introduced. This educational paradigm is transdisciplinarity.

LITERATURE REVIEW

The term “transdisciplinarity” was coined by the renowned philosopher and psychologist Jean Piaget in 1970. He also owns the first definition of the transdisciplinarity. He has wrote that after the stage of interdisciplinary research one should expect a higher stage – a transdisciplinary one, which will not be limited to interdisciplinary relations, but will place these relations within the global system, without strict boundaries between disciplines (Dzyatkovskaya, 2014).

The transdisciplinary approach reflects the peculiarities of thinking in the 21st century – the transition from the priority of conceptual thinking to conceptual, philosophical understanding of the world and oneself in it, with the destabilization of disciplinary boundaries, interculturalism and globalization characteristic of this approach (Telegina, 2006).

The Romanian researcher B. Nicolescu, one of the authors of the paradigm of transdisciplinarity, has developed the idea and outlined its new outlines. Due to the degree of complexity, the transdisciplinary approach to education is an approach based on the dynamics and interaction of four levels of educational intervention: monodisciplinary, multidisciplinary, interdisciplinary and transdisciplinary. It should be emphasized that recognizing the distinctiveness of these approaches does not mean ignoring their deeply complementary nature. B. Nicolescu, argues that “monodisciplinarity, multidisciplinarity, interdisciplinarity and transdisciplinarity are four arrows of the same arc: knowledge” (Nicolescu, 2007).

The most concentrated form of the transdisciplinary approach is presented in the Charter of Transdisciplinarity, which was adopted at the First World Congress on Transdisciplinarity (Convention da Arrábida, Portugal, November 2-7, 1994) (Freitas, Morin, and Nicolescu, 1994). The Charter says that life on earth is seriously threatened by the flourishing of a technized science that obeys only the terrible logic of production for the sake of production; there is a gap between the growing knowledge and the increasing impoverishment of inner identity. The transdisciplinarity is aimed at the semantic and practical unification of those meanings that are in the area of intersection and lie outside of various disciplines. The transdisciplinary vision goes beyond the realm of the exact sciences, requires their dialogue and their reconciliation with the humanities and social sciences, as well as with art, literature, poetry and spiritual experience and is essentially transcultural (Dzyatkovskaya, 2014).

METHODOLOGY

The problem of transdisciplinarity has at least two essential aspects:

- the philosophical aspect, which is associated with the promotion of a vision and a new understanding of reality in general and educational reality in particular – a transdisciplinary attitude;
- methodological aspect, which is associated with the development of specific ways of using various stages of integration in the educational process – transdisciplinary competence.

To form a transdisciplinary attitude and transdisciplinary competence, it is necessary to develop and implement two types of curriculum:

a) Curriculum relating to the implementation of cross-curricular learning
Transdisciplinary curriculum, i.e. curriculum that will ensure the achievement of transdisciplinarity;

6) Core curriculum that covers aspects of monodisciplinary or multidisciplinary compulsory education.

It is clear that not a single modern educational process in any country can be implemented only from a transdisciplinary point of view. There is a need for a harmonious balance of monodisciplinarity, interdisciplinarity, multidisciplinarity and transdisciplinarity at different levels of education.

One of the main points in the implementation of the paradigm of transdisciplinarity is the integration of school subjects. In some countries (Austria, France, Australia, Romania, USA), transdisciplinary education projects are being developed, but mainly for higher education. For general education, the mechanisms of transdisciplinarity have not been sufficiently studied.

**MAIN RESULTS**

In primary school, transdisciplinarity may be most pronounced. We believe that at this stage, three disciplines should remain monodisciplinary: Mother tongue and literature, Mathematics and Foreign language. Other educational goals can be achieved by studying certain cross-curricular topics, phenomena through which you can experience the "real world".

Finland has accumulated some experience in this direction (Halinen, 2018). In the Republic of Moldova, in the Primary School Curriculum (edition 2018), in the School Syllabus and in the Lesson Schedule topics and days for the implementation of transdisciplinarity are provided. Here are some suggested cross-curricular topics to study in primary school (Ministerstvo Obrazovaniya, 2018):

- Bread price (1st grade);
- ECO Christmas (1st grade);
- Let’s not forget those who are sadder than us (2nd grade);
- Language is the wealth of the people (2nd grade);
- Sport, movement, health (3rd grade);
- Healthy and tasty menu (4th grade);
- Small steps to a big and clean Planet (4th grade).

At the gymnasium level, monodisciplinarity (Mother tongue and literature, Mathematics and Foreign language) will be complemented by multidisciplinarity (for example, integrated disciplines such as Arts, World Cognition, Personal Development, Civic Education, etc.). Monodisciplinarity and multidisciplinarity will be complemented by cross-curricular topics that are significant for the formation of the student’s personality (for example, topics from the field of healthy lifestyles, entrepreneurial, financial and economic education, patriotic education, environmental education, family education, multicultural education, Internet security, technological development, etc.).

At the level of the lyceum (high school), in order to implement effective transdisciplinarity, it is necessary to take into account the specifics of each profile in the context of the future specialization of graduates in the university or to consider it from a professional point of view. For example, students of the Humanities profile will study the integrated discipline Science, rather than the separate disciplines of Physics, Chemistry and Biology. The Real Profile will integrate the school disciplines of History, Geography and Economic Education. An integrated discipline Arts should be compulsory for all profiles. Of course, the integration of school disciplines, at all stages of school education, must be carried out very carefully so as not to harm the process of the formation and development of students’ competences.

Didactic support for the implementation of transdisciplinarity in the educational process is an important part of the implementation of this paradigm. STEM and STEAM education...
is of particular importance in this regard. Science and technology are part of our lives, and using them in a way that is beneficial is essential. Instead of having children who are simply consumers of technology, we could have children who understand and use them consciously, or even create technology. Therefore, today the education system, including in the Republic of Moldova, needs new challenges and STEM approaches, which can revive interest in the study of subjects such as Science, Technology, Engineering and Mathematics. It is imperative that these disciplines become more engaging in order to awaken the imagination and inspiration of today’s students, the citizens of tomorrow’s world. Thus, STEM (Science, Technology, Engineering and Mathematics) education is becoming a priority for modern international and national education. STEM is an educational concept based on the idea of teaching students in four areas: Science, Technology, Engineering and Mathematics. STEM disciplines are taught in an integrated way, based on connection with reality, on direct observation, on experiment, logic, the experience of children. That is why the priority goal of STEM teaching is the implementation of integrated learning, through learning based on problem solving and project development. As a result, students engage in authentic, meaningful learning situations, including design, implementation, testing, analysis, and documentation. In this way:

- Critical and self-critical thinking of the student is developing;
- Innovations encouraged;
- Ability to cooperate and communicate effectively with others in solving problems and finding answers is developing;
- Understanding occurs through experimentation;
- Interest and motivation of students to learn increases.

The STEM learning is aimed at developing understanding the concepts, procedures and skills required to solve personal, social and global problems, which include the integration of Science, Technology, Engineering and Mathematics. In the process of STEM learning, the following aspects are implemented:

- Practical application of the learned material;
- Experimentation;
- Educational interdisciplinary projects of students: Biology, Chemistry, Geography, Physics, Mathematics, Informatics, Technology, Architecture, Metrology, etc.;
- Creative works of students related to crafts and arts;
- Research educational projects of students in STEM areas;
- Excursions for students to institutes, museums, research laboratories;
- Activities to promote science and technology education (fairs, exhibitions, camps, competitions for students).

STEM projects relate to curriculum (educational) standards for each STEM-related area, which include content appropriate to the level of school discipline, not isolating itself from the discipline, but increasing the integrative usefulness of learning.

STEAM (Science, Technology, Engineering, Arts and Mathematics) is a new approach to the concept of STEM that includes the use of STEM principles along with the integration of all humanities disciplines.

STEM / STEAM projects are carried out in conjunction with teachers who teach the disciplines involved in the implementation of the corresponding project. Each of these teachers will provide the necessary assistance to students in the relevant discipline during the project. The time allotted for the implementation of a project differs from project to project, from one week to two or three months. The defense of implemented projects can be public, including with the participation of parents.

The project is evaluated according to the following criteria:

- The validity of the project that is aimed to evaluate the degree of integrity and consistency, coherence and argumentation of the topic’s coverage;
The completeness of the project, i.e. is manifested in how the interdisciplinary connections and perspectives of the topic, competencies and skills of a theoretical and practical nature and how they serve the scientific content were emphasized;

Development and structuring of the project relate to the accuracy, rigor and consistency of the scientific approach, argumentation of ideas, correctness of conclusions;

Creativity refers to the degree of novelty that a project brings in its approach to implementing a theme or solving a problem;

The quality of the resulting product and its effectiveness;

Public presentation and defense of the project.

It is very important that the implementation of STEM / STEAM projects effectively contributes to the implementation of interdisciplinary and transdisciplinary connections.

For the effective organization and implementation of STEM / STEAM projects, we recommend drawing up a Technological map of the project. As an example, we offer the Technological Map of the STEM project "Water in our lives":

**Grade**: 7 (4–6 teams of 6–8 students).

**The goals**:
1. Analysis of water quality in the hometown / village;
2. Identification of problems related to water in the hometown / village;
3. Development of models of water filters;
4. Development of recommendations for solving problems related to water in the hometown / village.

**Areas of knowledge**: Physics, Geography, History, Chemistry, Biology, Mathematics, Informatics, Engineering, Medicine.

**School staff**: teachers of mathematics, physics, chemistry, biology, geography, history, computer science, mother tongue and literature.

**Visiting consultants**: engineers, doctors, parents.

**The end products**:
1. Chemical composition of water;
2. Charts;
3. Recommendations for improving water quality;
4. Samples of developed water filters;
5. Proposals for various water supply systems;
6. Proposals for improving the operation of sewerage systems;
7. Recommendations for the rational use of water;
8. Revealing the importance of water for personal health.

**Technologies**: the use of video cameras, computers, the Internet, etc.

**Project implementation time**: two months.

**Project Presentation and Evaluation**: Outside of school hours, projects are defended using Power Point presentations, models, graphs, etc. Anyone can take part: students of other classes, teachers, parents, representatives of the press, representatives of local authorities, invitees, etc.

We note that when implementing and defending STEM / STEAM projects, students are not given traditional marks. It is recommended to use assessment in a sports style, i.e. to award 1st, 2nd, 3rd places, encouragements, with the presentation of cups, certificates, medals, prizes, etc. Participation in such projects should be enjoyable for students.

Successively, according to the levels of education, STEM / STEAM projects provide for a consistent transition from educational-project situations to social-project situations and, finally, to social ones, from educational to social positioning, i.e., going beyond the educational space into real life situations.

So, the transdisciplinary integration is a synthesis of components of basic and additional
Conclusions

As a result, we believe that the introduction of transdisciplinarity as an educational paradigm will allow to:

- improve the quality of education;
- effectively implement individual educational routes of students;
- increase the motivation and interest of children in education;
- promote the conscious life and professional self-determination of graduates;
- orient students in various subject areas of knowledge;
- work effectively with a large amount of information;
- create your own knowledge base;
- deliberately transfer knowledge by students to different areas and use the knowledge gained in solving various problems in different situations;
- form and develop various competencies of students.

The main goal of transdisciplinarity refers to the student’s understanding of the surrounding reality, to his involvement in this reality as an active, responsible subject.

The introduction of transdisciplinarity in schools as a new educational paradigm is a necessity dictated by the times. But, to solve this problem, you should first find answers to the following questions:

- What should be the curriculum of the school in the context of the integration of school disciplines and the implementation of transdisciplinarity?
- Who will teach integrated disciplines and cross-curricular topics?
- What should be the didactic provision of transdisciplinarity and when will this provision be?
- How will school results be assessed in the context of the implementation of the new educational paradigm?

Finding answers to these questions represents the prospects and challenges for further research.

References


