HOW STUDENTS' RESEARCH COMPETENCIES LATENTLY CONTRIBUTE TO THE ACHIEVEMENT OF SUSTAINABLE DEVELOPMENT GOALS

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Abstract. The presented article focuses on the formation of students' research competencies with examples of manifestations of global problems of humanity. A methodological bridge has been laid between general secondary education institutions and higher education institutions in the systematization of theoretical knowledge, the development of practical skills and abilities, and the thinking of students. In a simple and accessible form, the structure of research competencies, the scheme of global problems of humanity in cause-and-effect relationships are presented, specific examples of manifestations of problems on the territory of the European state, in particular, the aridization of the climate of the South of Ukraine and global features of climate change, ways to solve them.

Additional research is required on the formation of students' research competencies in the relevant field of knowledge according to a certain classification (astronomy, physics, chemistry, biology, ecology, geography).
Keywords: research competencies, learning through research, global problems of humanity, Sustainable Development Goals.

Higher education in Ukraine is used in the term as "a set of systematized knowledge, skills and practical skills, ways of thinking, professional, ideological and civic qualities, moral and ethical values, other competencies acquired in a higher education institution (scientific institution) in the relevant field of knowledge according to a certain qualification at the levels of higher education, which are higher in complexity than the level of complete general secondary education" [1]. Traditionally, such a system of education distinguishes three levels: I –

primary education, II – secondary education and III – higher education, which is, as a rule, the pinnacle stage of the long-term formation of a professional worker. Of course, the complex processes of reforming the education system of Ukraine do not stop at the Concept of the New Ukrainian School (NUS is the reform of secondary schools), but will continue in the reform of higher education institutions (HEIs). Important issues are the updating of the content of curricula (in NUS – model curricula), which aim at the development of soft skills (soft skills) of students, the level of progress and proficiency in accordance with age, development strategy and assessment model, the inclusion of projects with an emphasis on action, and not just analysis. The reform of the adult education system is aimed primarily at lifelong learning, advanced training and retraining of teachers of general secondary education institutions (HEIs) and teachers of higher education institutions, their certification, internships, financing, development of coaching, mentoring and mentoring programs.

The Order of the Ministry of Education and Science of Ukraine (MES of Ukraine) No. 1303 of 16.10.2019 on the "Standard of Specialized Education of Scientific Direction" provides the following definition of what ***a student's research competence is – the ability of an*** applicant to perform research educational tasks, carry out research activities aimed at obtaining new knowledge and/or finding ways to apply it, in accordance with the profile of study [2, p. 2]. The purpose of introducing this standard is that a student of a secondary school, as well as a student of a higher education institution, does not just reproduce ready-made information, but is able to independently acquire new knowledge and draw conclusions. By ***research competencies***, we mean, first of all, a set of knowledge, skills, and attitudes that ensure the student's ability to independently plan, execute, and present research results. The structure of research competencies includes motivational-value, cognitive, activity, communicative, and reflective components (Table 1).

Table 1. Structure of students' research competencies

№	Structural component	Educational objective
1	***Motivational-value (axiological)*** • Interest in learning new things. • Awareness of the significance of research for life, community, science.	***GOAL:*** to awaken interest in research, to show their significance.

	• Holistic attitude to science. • Critical thinking. • Responsibility. • Intention and emotional involvement. • Motivation.	
2	***Cognitive (knowledge)*** • Understanding of scientific concepts and research methods. • Knowledge of the stages of research. • Knowledge of the rules for working with sources. • Academic integrity.	***GOAL:*** to give students the basic knowledge and skills that are needed for research.
3	***Activity (proxological)*** • Generating an idea through creativity. • Setting the purpose and objectives of the study. • Putting forward hypotheses (assumptions). • Selection of research methods and tools. • Data collection, processing and analysis. • Formulation of conclusions.	***PURPOSE:*** - to teach the student to participate in the problem statement and research planning; - to form the ability to independently organize most of the stages of the study.
4	***Communicative (socio-behavioral)*** • Ability to work in a team. • Ability to present results orally, in writing, visually (graphically). • Discussion and argumentation of the position in the form of communication.	***GOAL:*** to ensure the complete independence of the student in the activity.

	• Interact with other researchers in the form of collaboration.	
5	***Reflective (intuitive)*** • Evaluation of one's own actions and results. • Ability to make changes in the research process. • Critical attitude to information. • Put forward new ideas, hypotheses, theories.	***GOAL:*** to form the student's desire for personal growth.

What is the value of the presented table for the teacher and/or teacher? First of all, we must realize that in order to achieve certain success in the formation of research competencies among students, they need to go through all stages individually, in accordance with the level of education received: from preschool, primary, secondary, higher, postgraduate and others. In other words, we cannot teach students to do all this until we teach them with simpler examples or samples. Here it will be appropriate to apply the didactic principle "from simple to complex", which provides for the gradual complication of educational material and tasks, which contributes to better assimilation of knowledge and the formation of skills. And here we came to the problem not only of the NUS, but also of the international educational system, how to distribute the content of education at certain stages and levels of achievement, that with each subsequent stage to add a new one – there may be theoretical knowledge or tasks of an applied nature, and most importantly – how to help the student and/or student achieve a certain (we will consider the maximum level for him), and then choose the next, more difficult step in the development of their abilities.

Important educational aspects of the present and the near future are the problems of studying climate change, STEM/STEAM integration, green technologies, digital tools, in particular, in the natural sciences, etc. These are the ***global problems*** that manifest themselves in specific local conditions, for example, in Ukraine: the *problem of war and peace* – the war since 2014, *environmental disasters* – the nuclear accident at the Chernobyl nuclear power plant in 1986, *demographic problem* – population decline since 1979, etc. (Fig. 1).

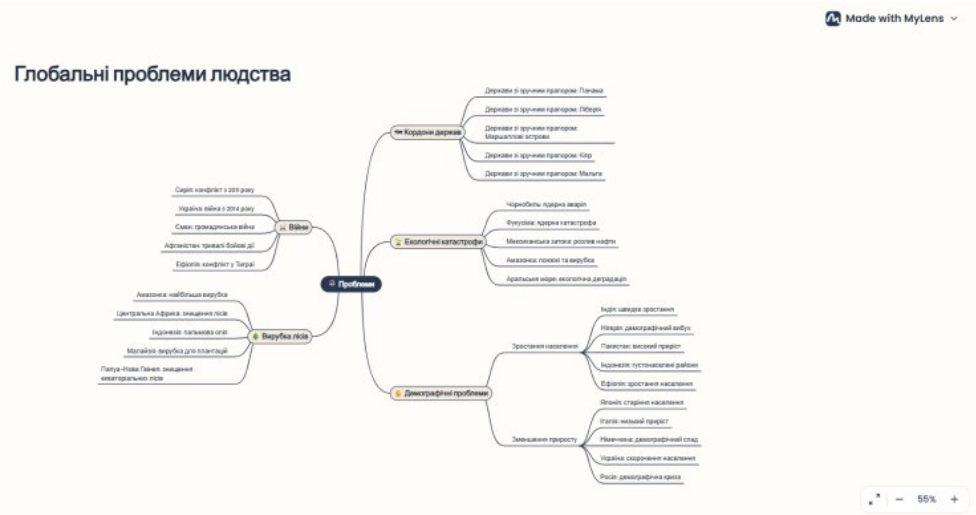


Figure 1. Global problems of humanity. Content was created using the MyLens.AI service [4]

If we consider the problem of climate change in Ukraine in a more specific way, then the main aspect of the study of pupils and/or students should be aimed at changes in climatic indicators – air temperature and precipitation. With reliable data, we can teach students to understand the causes and consequences of major climate change and, most importantly, direct their attention to finding ways to solve the global problem at the regional level. For example, you can use Table 2 to cover the entire complexity of the problems under study (Table 2).

Table 2. Regional features of the aridization of the climate of the South of Ukraine

Global changes	**Regional changes**			
	Of climate	**Of water resources**	**Of soil**	**Of vegetation**
1. Greenhouse gas emissions (mainly carbon dioxide and methane)	1. Greenhouse gas pollution of the atmosphere	1. Pollution of water resources with harmful substances, plastic	1. Soil pollution with harmful substances	1. Habitat fragmentation
2. The	2. Increase in	2. Water	2. Reducing	2. Occurrence

occurrence of the greenhouse effect (increases the global air temperature)	air temperature by 2.0º C [5, p. 19]	bloom, hypoxia, overseas phenomena [6, p. 12-13]	the amount of moisture in the soil	of fires in the natural environment
3. Cause of global warming	3. Decrease in rainfall	3. Reduction of surface runoff	3. Moisture deficiency in summer	3. Invasion of invasive species
4. As a result, climate change	4. Increase in extreme weather events (squalls, showers, hail, thunderstorms)	4. Increase in extreme weather events (floods, floods, storms)	4. Decrease in the yield of agricultural pellets	4. Biodiversity losses

Data on the regional features of climate aridization in the South of Ukraine are available both for students of secondary schools and for students of higher education institutions for a deeper study, which should be based on research on the ground. This process is quite complex and has its own characteristics for implementation. But only on the ground, we will be able to clearly demonstrate the structure of the problem: from sources of pollution to ways of solving (how the system of early warning of extreme weather events works), ***water resources*** (water resources management, in particular, early warning and flood response systems), ***soil*** (cultivation of the second crop after harvesting the main crop, such as winter wheat and spring barley, condition and modernization of flood control dams, transition to drip irrigation technology, drought-resistant crops, in particular, the cultivation of rice, corn, sorghum, millet, amaranth, new crop rotation) and ***vegetation*** (monitoring of invasive species, expansion of the network of protected areas), etc.

We need to develop students' creative approach, understanding of the causes and consequences of global problems, ways to solve them (Table 3).

Table 3. Global features of climate change*

Global problem	**Reason**	**Consequences**	**Solutions**	**Distribution regions**
Pollution by greenhouse gases of the atmosphere	Burning fossil fuels for power generation and heating	Greenhouse effect	Reducing greenhouse gas emissions	Everywhere, especially East Asia and North America (USA)
Global warming	Increasing greenhouse effect on Earth since 1850	Increase in global average air temperature, drought, floods, soil salinity	Reducing greenhouse gas emissions, efficient energy consumption, switching to renewable energy sources	Everywhere, including Europe (Carpathians, Eastern Europe)
Climate	Caused by fluctuations in solar radiation, seismic activity and anthropogenic activity	Changes in precipitation regimes and other climatic phenomena		Everywhere
Melting glaciers and permafrost	Global warming	Melting glaciers, changing the direction of winds and ocean currents, increases the risk of volcanic activity, the release of dangerous		Widely distributed, especially in Antarctica and Greenland, northern North America and Eurasia (Siberia, Central Asia,

		microorganisms		Himalayas)
Rising sea levels	Melting of glaciers and expansion of water when heated, drying of continents	Flooding of coastal zones, island states and coastal cities	Reducing greenhouse gas emissions	It's happening slowly
Biodiversity losses	Destruction of natural environments, in particular, deforestation, construction, urbanization and agricultural activities (ploughing, grazing), environmental pollution, spread of invasive species, uncontrolled hunting, fishing, mining	Negative impact on ecosystems and living organisms, reduced access to food, medicinal plants and raw materials, the emergence of new diseases		Increases exponentially
Increase in extreme weather events	Increasing greenhouse effect caused by human activities, increasing the temperature of the Earth's surface and the ocean	Increase in the frequency and intensity of droughts, floods, storms and heat waves, forest fires	Reduce greenhouse gas emissions, switch to renewable energy sources, establish international cooperation	Global character, especially Pakistan, India, South Sudan, Spain, Kazakhstan, USA (Texas, California), Caribbean countries

Drinking water shortage	Climate change due to human activities, such as pollution, inefficient use of water, soil degradation and deforestation	It increases poverty, leads to the spread of infectious diseases (cholera, dysentery, hepatitis A, gastroenteritis) and negatively affects ecosystems		Everywhere, especially North Africa (Sahara), Middle Eastern countries, Mediterranean-Maritime (Italy, Spain)

[*compiled by the author according to the United Nations News Center https://news.un.org/en/ 2024-2025]

No less difficult in students' research are the problems of the emergence of El Niño and the transition to La Niña, the energy transition to renewable energy sources (RES), the reduction of food waste, the use of digital technologies to combat climate change, measures to strengthen social protection and mitigate the negative consequences of these changes.

And therefore, we must bring learning as close as possible to the practice of life, because the younger generation will be the key participants in this process. Thus, according to the United Nations (UN), by 2050, people who are now less than 25 years old will make up more than 90% of the main workforce [3]. In the UN materials, we can find examples of how young people implement the Sustainable Development Goals (SDGs) on the ground, offer to explore complex problems through various interesting forms (actions, campaigns, advisory groups), holding thematic days and memorable dates (International Day of Women and Girls in Science, World Youth Skills Day, International Clean Energy Day, and 2025 is the International Year of Glacier Conservation), etc. All these measures are aimed at accelerating progress in the implementation of the 2030 Agenda for Sustainable Development.

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