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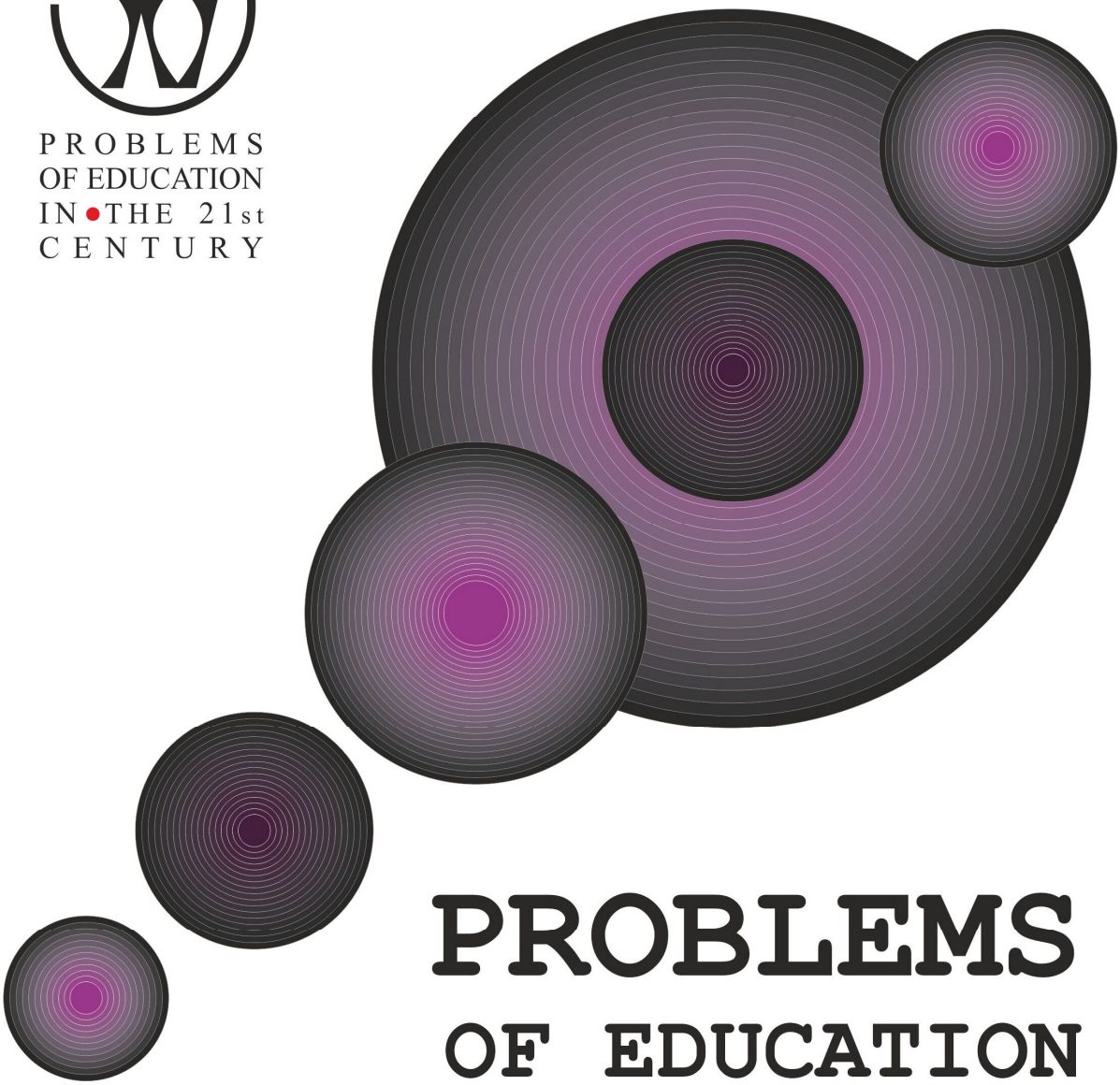

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SYSTEM AS A WHOLE AND EDUCATION AS A SYSTEM: RELEVANT THOUGHTS AND CONSIDERATIONS

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It is obvious that the World is the largest and most complex system. It is obvious that the essence of the World cannot be known without analysing it as a system. System (gr. *system* - connected, composed of parts) – a collection of elements components) that are interconnected by certain connections; this forms a whole in one form or another. The whole can be understood quite differently (various contexts), but basically, three important moments can be distinguished: a system as a certain whole (a certain organised and interacting set of components, performing a certain function (s) and having a purpose (s)), a system as philosophy (simply all things in the world are connected), a system as technology (technological system or systems act as certain entities). Of course, the goal here is not to discuss deep methodological issues of systematics (systemology).

A system is a set of parts (objects and subjects) and their connections (Hubka & Eder, 1988); the order, which is caused by the planned, regular arrangement of parts in a certain relationship (Gudas, 1999); can be perceived as a living organism that develops and changes due to its internal needs and environmental influences (Gudas, 2000); a set of interrelated parts, discerned in an environment that is of interest to people (Broks, 2000); a system is a need to avoid contradictions (Morkūnienė, 2002); a "form" of a fully developed whole (Hegel, 1959); mathematical abstraction as a model of a dynamic phenomenon (Friman, 1983); a connection of different phenomena, distinguishing them from the environment as a single, relatively independent entity (Tidikis, 2003), etc.

> "We are talking about systems in different ways: sociologists talk about society as a social system, psychologists – about a mental system, biologists – about a bio-system. Experienced gamblers play according to the system, and science is legitimately required to develop systematically. So, if we are talking about a system, then, of course, a certain compound unity is in mind, a certain arrangement, which is formed not accidentally, but according to a certain order" (Anzenbacher, 1992).

The concepts of the term "system" are diverse, they can be divided into several groups:

- The concept that a system is a whole of self-related elements (e.g., a system is a whole of related elements, characterised by hierarchical organisation and interaction between elements; a system is a unified whole of various elements);
- The concept, using the term "whole knowledge" (e.g., a system is a whole of knowledge, theories, terms and concepts; a system is a whole of theoretical and practical knowledge arranged in a strict logical consequence; a system is a whole of theoretical, empirical and methodological knowledge components);
- The concept, using the term "whole of methods" (e.g., a system is a specific type of comprehensive examination of problems; a system is a means of examining integration - a whole of methods for educational phenomena examination, etc);
- The concept, using the term "structure" (e.g., a system is the structure of various components at different levels, etc.);

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- The concept, using the term "goal" (e.g., a necessary property of a system – goal pursuit /Licker, 1987/; complex systems have a goal and strive to achieve it).

Knowing the system is not easy, but extremely important. From what was said before, it can be said that in order to fully understand any system, you need:

- determine what components (elements) it is made of;
- determine what the structure of the system is;
- analyse what are the functions of the considered system and its individual components, their harmony and subordination;
- determine the essential factors guaranteeing the integrity of the system;
- determine the relative autonomy of the system;
- determine the nature of interactions and connections between the system components;
- describe the position of the system in relation to other systems and the interaction with other systems;
- determine the nature of the system change and other characteristics.

From what has been said, it is obvious that the knowledge of systems helps us understand three essential moments, i.e., system structure, their functioning mechanisms, and mutual connections and interactions. On the other hand, in order to know, you need to constantly delve into the system structures, their functions, and be able to understand their operation in the real world.

It is important to realise that the system has qualitatively new properties than the elements that make it up. The elements individually do not possess these new properties. The elements can be very diverse: physical objects (celestial bodies, minerals, crystals, etc.), subjects (students, teachers, employees, etc.), ideal objects (axiom systems, a system of basic didactic terms, a system of natural science and technological education terms, etc.). As a rule, a system consists of at least two elements, between which there is a connection. Of course, systems form after the breakdown of the previously existing complex system. The following systematic laws known to science can be mentioned:

- relationships and connections in the system exist in various forms – coordination and compatibility, dissonance, subordination, neutrality and autonomy, etc.;
- any system is localised in space and time;
- any system interacts with the environment, there are no absolutely isolated systems;
- by disintegration any system can turn into another system, quasi-system, aggregation, chaos or "dissolves" in the environment;
- systems are always subordinate to the whole and specified according to functions, non-functional parts of the system are non-viable;
- self-evolution is characteristic of the system, i.e., the immanent contradictions within it cause its self-evolution;
- system self-protection, i.e., any system tries to solve internal and external contradictions to avoid any fragmentation and maintain integrity, etc.

In other words, information, material, and energy flows circulate in every system. All these enter the system as input elements, are transformed in the system, and leave the system as output elements.

From the philosophical, methodological point of view, a system is a philosophical category, closely related to such concepts as "part" and "whole", "element", "relationship", "connection", etc. More than 40 basic definitions of the term "system" can be found in scientific literature.

The human ability to systematize (perceive, analyse, and understand systems) becomes essential. To systematize- to arrange according to a system, to place in a certain order, to

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establish a certain sequence, consistency (TŽŽ, 1985). Rational cognition is always systematic. It consists of consistent thinking operations, which result in the formation of an imaginary system more or less adequate to the objective reality system. In order to function effectively in a complex world, systems attitude, systems thinking, and systems approach are essential things. This needs to be taught and learnt from an early age. Although there is a widespread position that systems thinking is very important in various life and activity spheres, this very significant ability, according to researchers, still remains outside the boundaries of general education school (Arnold & Wade, 2017).

Practical human activity is also systematic, but the level of systematicity grows with the continuous accumulation of knowledge and experience.

The main connections between many elements of the system are internal systemizing connections guaranteeing a uniform structure of a certain system and giving integrity to the latter. The connections between the elements of a system determine its interaction with the external environment. Various typologies of communication are presented in scientific literature. One can distinguish cause and condition, purpose and function, external and internal, functional and statistical and other connections. Gudas indicates physical or technological, logical, informational (transactional) connections and connections in time (Gudas, 2000).

As we know, interaction relationships are the best way to characterise learning as a whole system. No system exists without interaction, without exchange of information with the environment. Speaking about education it can be said that it is a complex system. Such a system (s) consists of a wide variety of relationships with the environment. Such systems are studied comprehensively. It should be mentioned here that complex systems are characterised by self-organising processes. From this point of view, educational systemology is closely related to synergetics (gr. *synergetikos* – working together) – a science that studies self-organisation processes in complex systems, which result in the formation of new spatial and temporal structures (TŽŽ, 1995). It follows that the object of synergy is the dynamics of systems. In a certain sense, it can be said that synergetics is the successor of the ideas of cybernetics, BST, and evolutionary science. Systematicity is one of the most important principles of synergy. It is necessary to note that synergetics today permeates all branches of modern science. One can only imagine what cognitive possibilities it hides in itself. Ignorance of synergy can cause irreparable intellectual damage. Researchers distinguish various types of systems, analyse their various features and properties. For example, after analysing the sources, Targamadzė distinguished seven types of systems, described by the following features (Targamadzė, 1996):

1. Scope of the system.
2. Complexity of system elements and their connections.
3. Structure of the system from living and non-living elements.
4. Relationship of the system with the environment.
5. System change over time.
6. The possibility of predicting the development of the system.
7. System reaction to environmental influences.

The most diverse systems are distinguished, taking into account their essential characteristics. Various classifications of them are presented in the scientific literature. In general, researchers distinguish different types of systems: artificial and natural, mechanical and organic, dynamic and static, open and closed, adaptive and evolving, dogmatic and critical, etc. Ackoff defines such concepts as an abstract and concrete system, system environment, open and closed systems, etc. In his opinion, these concepts are most important when speaking about systems thinking (Ackoff, 1971). Ackoff pays special attention to the system behaviour,

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believing that systems should be classified based on this. Many researchers treat educational systems as special (Broks, 2016; Zera, 2002). For example, the main elements of the educational (pedagogical in a narrower sense) system can be the following: teacher (s), student (s), teaching and upbringing content, means of teaching and upbringing, etc.

Therefore, according to Targamadze, the education system can be described as large (consists of subsystems: general education, vocational training and others), complex (consists of separate models: secondary education, higher education, adult education and others), live (people act), open (interacts with the cultural, social, economic and other environments), dynamic (changes over time), probabilistic (its development can be predicted), organic (flexibly reacts to environmental influences) or mechanical (not characterised by flexibility) (Targamadzė, 1996, p. 98). The education system is also understood as a set of institutions and events, through which education is carried out in a separate cultural system, state or social group and specific people are educated (Masaitis, 1997). Researchers emphasize that an educational system is a highly coupled complex system of inputs, outputs, sensors, and actuators (Wallace, 209).

Education systems can reasonably be divided by size: *small* (e.g., N school supplementary education system), *medium* (e.g., N school education system), *large* (e.g., N district, city, regional education systems), *super large* (e.g., N country education system, European education system, etc.).

The characterisation of the pedagogical system as a polysystem is quite justified because, in reality, a great number of people work in each pedagogical system, each of whom is also a system. In the same way, we can describe educational systems (of various levels) by applying other terms of systemology. Education systems have resources, under certain conditions they themselves become resources. Education systems have goals that can be both short-term and long-term, different according to the levels (e.g., international, national, regional, local), etc. This aspect is extremely important. From the systemological point of view, the definition of goals is a difficult problem because it is basically impossible to describe the system's goals while in the system ("inside" the system). It is only from the outside that it is possible to observe the interaction of the education system at a certain level with the environment. The problem is, who is that external observer (e.g., school head, head of the regional education system, system analyst, education politician, etc.) and how competent he is to understand why the given system behaves in one way or another. Education systems are dynamic structures, they change over time. If we say at a very generalised level, then, for example, the Lithuanian education system underwent fundamental transformations after 1990 – it changed both qualitatively and quantitatively. Coherence is also a characteristic of education systems. Although it is generally accepted that in the education system, all its components are weakly connected with each other, nevertheless, in this case as well, we can talk about strongly and weakly connected education systems. Educational systems are characterised by a certain behaviour in the environment. We say that the education system functions well (system elements perform their functions well) or poorly (system elements perform their functions poorly or most of them do not function). Education systems are inherently protective. In other words, they try to protect themselves because one system is a resource in relation to other systems (e.g., one of the resources of the higher education system is the general education system, etc.). The system protects itself by strengthening its marginal elements. If it is extremely weakly connected, then the system is more resistant to external pressure, it can "sacrifice" some of its elements in the name of survival. In a certain sense, the issue of protection (defence) against the education systems of other (foreign countries) is relevant to the Lithuanian education system. When politicians discuss whether Lithuania will become a modern European state in the context of other countries or whether we will only be a nation of "servants" – it is precisely the aspect of protecting the system that should be kept in mind. Of course, this does not mean that politicians talking like this really understand the essence of protecting the education system. From what has been said,

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One thing is obvious, without taking care of the protection of our education system, we risk becoming resources of other systems. In a certain sense, this is what happens through the "brain drain" process.

Of course, this should not be confused with another characteristic of systems - cooperation. Education systems can exchange the resources they have. From this point of view, Lithuanian education can (this is happening) exchange available resources with the education systems of other countries. Again, what is the balance (wins and losses) of that exchange? From this point of view, the aspect of balance is relevant. Another extremely important feature of education systems is competition. Competition in the education system (s) can be both very strong and weak. The axiomatic statement is clear – when resources are scarce and do not meet needs, then the competition is quite strong. If we were to raise the question, what are the most important needs of the Lithuanian education system and what are the available resources to realise them – it would be extremely difficult to answer (e.g., recently there has been an active discussion about Lithuanian universities and other higher school competition in the unified European Union space). If Lithuanian politicians presume that the future Lithuania is an intellectual, strong, and mature nation, do we have adequate quality and sufficient resources for that? Education from a systemic point of view was discussed in a previous publication (Lamanauskas, 2023).

On the other hand, if we were to examine the education system at the level of educational institutions, we would clearly see that educational institutions are characterised by high specificity. In other words, they are individual. The individuality of educational institutions can be described as follows:

- the scope of the educational institution as a system, its position in relation to other systems of the same or different level and interaction with them;
- characteristics of the system elements (e.g., pedagogical, sociocultural, demographic, political, etc.);
- the complexity of the relationships between elements, their nature;
- the degree of system autonomy;
- the degree of system adaptability in the environment;
- educational process peculiarities (goals, content, forms, methods, etc.).

Broks notices that systems are abstract reflections of world phenomena in human consciousness (Broks, 2001, p.69). In other words, it is obvious that a person always isolates something in the environment that interests him (isolation of the whole). What he singles out is a system because the singled-out object is made up of interacting elements. Also, when elements (details) form a whole, it becomes simple. Every system, including education, has a boundary that separates it from its environment. The difference is that the boundaries of closed systems are very strict, while those of open systems are flexible enough. It is important to realise that the interaction of the educational system with the environment is very complex, especially with the social environment. Educational systems, like any other, change over time, i.e., they are dynamic. It is necessary to evaluate this property in the future development perspective of the system. Educational systems form (are formed), develop intensively, experience collapse. In all phases of the system development, an important thing is – its ability to adapt to the environment. From a methodological point of view, it is very important to analyse the state of a specific system at various stages (phases) of its development. We often say that education must be systematic. But what does this mean? Unfortunately, a deeper understanding is sometimes lacking. It is important to emphasise that all parts and elements of the education system should be included to the maximum extent and perceived as integral parts, seeking the established common goal.

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