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EDUCATION FROM THE SYSTEMIC POINT OF VIEW: THE CONTEXT OF (NON) - CONSTANT TRANSFORMATIONS

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It is generally undeniable that education is a complicated and complex system. Moreover, it is an integrated and integral system of teaching and learning at different levels and in different contexts. In the public academic educational discourse, the need to search for modern teaching and learning methods is constantly expressed so that educational institutions can better respond to the changing educational needs of learners and society. However, there is no unequivocal answer to what is "modern". Complex knowledge of education systems (and education as a system) guarantees effective educational changes in them. If we are talking about scientific knowledge of educational phenomena, it cannot be otherwise. Based on this point of view, most educational phenomena and processes can be called systems. According to Morin (2014), solving the problem of complexity means confronting concepts that have been scientifically ignored for a long time.

> "Education process and teaching are just the complex systems that include many related elements and are conditioned by even more external factors" (Vaitkevičius, 1988).

Every complex system differentiates into subsystems and their constituent components. An educational system, as a social one, differentiates into certain parts, elements, etc., down to the smallest structures performing defined functions. This doesn't mean in any way that the functions of these structures are exclusively useful for the system, i.e., do not harm its functioning. It can also be the opposite when the functions of certain system structures are not useful for the system as a whole. From this point of view, a complex system is a multi-level structure (for example, we usually say that there is a Lithuanian education system, which consists of many various level subsystems – the educational systems of regions, counties, cities (districts), and individual institutions). Each educational phenomenon is understood as a structural system of various components. It is not a simple sum of these components. Each of them occupies a different, unequal position in a certain system, which means that each of them has different characteristics. In addition, various processes take place in each component, such as receiving and selecting information, processing, etc. More importantly, the performance of any component affects the performance of all other components to some degree. From the above, it can be seen that every system can be controlled. An important role is played by the principle of system – a methodological principle of the analysis of phenomena (Psychology Dictionary, 1993).

Therefore, one of the most important tasks of systemology is to distinguish stable characteristics in objects such as properties, signs, peculiarities, functions, relationships, etc. The theorists of systematics (systematicity) state that systemicism is a new approach to the world, having formed in the 20th century and which is not complete. Finally, the systemisation process itself is characterised by:

- High degree of generalisation.
- Interdisciplinarity.

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- the comprehensiveness and completeness of approaches when examining the phenomenon of education.
- hierarchy and complexity of knowledge.
- highlighting the contradictions, etc.

It is obvious that the term systemic approach in education is quite often encountered in educational literature. Most researchers agree with the opinion that such an approach is appropriate and effective in order to better understand complex educational phenomena. When applying a systemic approach, the latter are not analysed in isolation or in a simplified manner. The aim is to perceive the phenomenon as a unified whole, interacting with other phenomena. Therefore, it would be logical to say that it is much more important not to name individual objects as systems but to systematically write textbooks, study books, and other teaching/learning aids, and finally to systematically compile programmes for various educational levels or university lecture courses. On the other hand, it is necessary to know various connections between educational phenomena, although it would seem that it is sufficient to determine only the essential ones. Finally, as Betts (1992) states, many people claim to be using a systemic approach, but in reality, they are not. It is much more important (especially for decision-makers) to fully understand the difference between the approaches applied at a concrete moment and the systemic approach. It is undeniable that the systemic approach application in education is important and extremely relevant in the 21st century. Researchers point to various purposes for applying a systemic approach. For example, Fahmy and Lagowski (1999) identify the following essential goals:

- to increase students' ability to think systematically.
- to increase the ability to see the relationships between things more than the things themselves.
- to increase teaching/learning effectiveness.
- to make a subject such as chemistry attractive to learners.
- to increase the ability to analyse and synthesise seeking creativity, which is the most important product of a successful education system.
- to create a new generation capable of constructively acting in various systems.
- to increase the ability to apply the systemic approach in one's own activity solving the most diverse problems and to find creative solutions to them.

Researchers emphasise that applying a systemic approach can help learners begin to understand the interrelationships of concepts in a broader context (Fahmy & Lagowski, 2011). The essential thing is how to realise meaningful integration and guarantee teaching/learning interdisciplinarity.

A number of critical remarks are made on the issue of the systemic approach. It is claimed that the systemic approach is not only a different way of describing and examining educational objects, but one of the most important instruments for solving methodological and theoretical problems of education.

It is obvious that there is a need for detailed research on the productivity of applying a systemic approach to the cognition of educational phenomena. It is no less important to establish criteria, that would allow us to draw a line between systemic and non-systemic education research. When answering the question of why the systemic approach is necessary and unavoidable in the current conditions, it would be necessary to accentuate:

- we all live in conditions of globalisation, where every day we see global politics, economy, culture, information, architecture, etc.
- in many aspects, the relationship between man and nature (interaction with it) is inadequate, wrong. The consequence of this is various environmental, ecological, and other problems (e.g., global climate change), the solution of which is very complicated.

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- human interaction in society is complex. It is desirable that his behaviour in it would be constructive and not destructive.
- terrorism, as an international phenomenon of today's world, strongly influences the economy and security of any country, etc. We never know what challenges lie ahead.

The essence of the systemic approach is to reveal the most diverse connections of the system – from fundamental and important to simple, not complicated connections and to know not only the system itself but also the environment, in which the given system is located.

The systemic approach in education is examined in close connection with integration (Lamanauskas, 2003), and systemic analysis and synergistic approach are perceived as an effective instrument for examining the problems of modern education. The significance of *the systemic view* is analysed in educational academic literature. As researchers note, in this way we develop cognitive ways of knowing about many interrelationships between the system components and even the relationships between the system and the environment, in which the given system exists (Bateson, 1979; Bawden, 1991; Carr, 1996). A systemic view is extremely important when we analyse many educational problems at the same time or, for example, design didactic systems. It is obvious that from a systemic point of view, we can rely on our activities in various ways. Even those who affirm not acknowledge the systemic view, unconsciously adhere to it choosing this or that material and the questions to be analysed (Ozmon & Craver, 1996). According to the authors, the system emerges even in an eclectic view, selecting fragments and elements of other systems. What is more, in a dynamic world, the nature of problems is constantly changing. And this is undoubtedly related to systemic thinking. According to Carr, systemic thinking requires keeping in mind many aspects of a problem at the same time (Carr, 1996), being persistent because thinking systematically means constantly reflecting on previous assumptions and at the same time being flexible when changing thinking (Reigeluth & Garfinkle, 1994). On the other hand, teaching and learning is a complex process that is not easily changed. Today's realities seem to presuppose another paradigm – continuous learning. The centre of gravity shifts from teaching to learning. However, the systemic approach still requires analysing teaching (itself) as a double-sided interaction process. According to Hall, any changes in educational practice in classrooms, schools, and other educational systems are equally complex, requiring systemic thinking (Hall, 2000). It is obvious that *systemic thinking* and *systemic view* are two essential prerequisites for *systemic change* in education. The principle of a systemic view requires the object of analysis (e.g., education) to be examined as a system, which according to Cibulskas (1989) means:

- to describe system components qualitatively and quantitatively.
- to determine the relationships of the elements that make up the components (microstructure).
- to describe subordination relations of microstructure elements.
- to clarify the relations of the object of analysis with the environment (macrostructure).
- to distinguish the system-forming relations in the microstructure, without which the object of analysis as a whole is impossible.
- to examine each component of the object of analysis as a part of a system – a subsystem, and the latter – as a subsystem of an even lower subsystem.
- to analyse the object as a whole, knowing the properties of the components, their elements, and, conversely, to analyse the properties of these components, knowing the general characteristics of the system.
- to fix the object of analysis as constantly changing.

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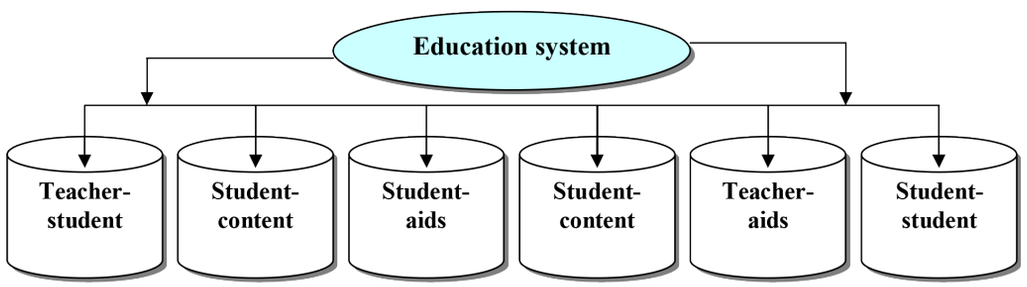
By applying the systemic analysis, we can get to know the functioning of various systems in more detail. According to Butkus (2007), every phenomenon should be treated as a static system, consisting of related elements and only later try to find out its functioning as a dynamic system. For example, by analysing at the level of educational systems, it is possible to distinguish some subsystems that are extremely important for their effective functioning (Figure 1).

Figure 1
The Most Significant Subsystems of an Educational System



The most diverse factors are manifested in each of these subsystems. For example, in the "teacher-student" subsystem, an extremely important factor is the degree of relationship between the student and the teacher- from complete freedom of choice to extremely strict determination. From a methodological point of view, it is important to know in detail the most important factors of each subsystem and how these subsystems interact with each other. The next stage is the clarification of optimal conditions for the functioning of the entire system. Obviously, on the basis of general systemology, we can say that one of the essential tasks of systemic research is the analysis and synthesis of systems. Analysing any educational system, we, first of all, separate it from the environment and determine its structure, functions, properties, systematising factors and relationships with the environment. On the contrary, in the process of system synthesis, a model of a real system is created (systemic modelling), and the main characteristics of such a system are determined.

Thus, following the systemic approach, we can much more effectively know the education system of any level, i.e., penetrate deeper into its internal structure, to see the overall picture of the component interaction. A thorough knowledge of the educational system is an essential prerequisite for its management. In a certain sense, it can be said that the education reform carried out in Lithuania since 1990 was characterised by insufficient systematicity. The educational guidelines say that the reform was carried out in an insufficiently coordinated manner, too slowly and with insufficient response to the rapid changes of the post-communist reality, time challenges, and changing needs of society (Švietimo gairės 2003-2012. Projektas. Vilnius, 2002, p.10). It is a well-known fact that complicacy/complexity is the main reason for the failure of any educational reform (Sarason, 1990).

Another important thing develops from here – the preparation of educators (and all other education participants) to systematically act in educational reality, to change and reform it. In this case, we are talking about the systemic reform of education. However, systemic reform requires significant changes at many levels of the education system and especially in schools (Tice, 1992; Thompson, 1994). For this, it is necessary to take care of teachers' new thinking, the wholeness of universal educational ideas (Juodaitytė, 2002), to project education itself into the future, i.e., to constantly raise new ideas, to form a vision of future education (Lamanauskas, 1997). There is no doubt that knowing the ABC of education systemology is

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one of the main instruments for effective educational change (Lamanauskas, 2022). Recently, it is fashionable to say, even to repeat constantly, that educational paradigms/trends/models are changing. But again, there is often disagreement about which paradigm system is being spoken, as there is clearly a diversity of paradigms. In any case, the paradigm change in education is only a microcosm of changes in society as a whole. Finally, it is argued that all previous paradigms have been engulfed by a certain paralysis, and systemic thinking is precisely the new educational paradigm (Banathy, 1991; Betts, 1992). Another important characteristic of systemic change in education is thoroughness and comprehensiveness. A fundamental change of the system in one aspect requires fundamental changes in all other aspects, in order for the change to be successful as a whole (e.g., in the education system, any change involves all its levels: classroom, school, community, region, etc.). From a systemic point of view, it is important to realise that sometimes educators, education politicians, etc. are mistakenly convinced that schools are still not organised as they would like, so this situation calls for new, additional reforms. Then a situation arises, which can be called a parade of reforms, simply a fashionable thing ("*flavour of the month*").

It is unanimously agreed that educational systems occupy a special and distinctive place in the entire field of social systems. Since there is an exchange of information between educational systems and the external environment, they can be considered open systems. Analysing characteristics and regularities of educational systems, the following points are important:

1) Hierarchical organisation of educational systems, revealing the specifics of their levels.
2) Description of the elements of education systems, their structural, functional organisation, general and specific characteristics, and general regularities of educational systems.
3) Each education system is a set of elements that are related to each other and form a certain whole. Such a whole distinguishes itself in qualitatively new properties than each element separately. On the other hand, each educational system is characterised by a specific internal structure unique to it, so it can be said that it is partially separated from the environment and stands out from it as a certain unity.
4) Educational systems, like any other, are characterised by a state of equilibrium, continuity and transferability, and temporality. It is extremely important to emphasize the development cycle of systems - emergence, growth, prosperity, break, decline and death. There are no eternal systems.

Each educational system can act as a sub- or meta-system in relation to the other. For example, a lesson, which is a subsystem of the educational system, can in turn be treated as an extremely complex educational system. In the same way, we can treat an educational institution as a complex socio-educational system, in which the most diverse lower-level systems (subsystems) exist. In other words, any educational system, in its turn, can be an element of another (higher) educational system, which in this case is an external environment in relation to the previous system. For example, if we say that a school class is a system, then a school (consisting of classes and a team of teachers) will be a higher-level system. The school in its turn is, for example, an element of the N city education system, the latter an element of the education system of the N region or country. Practically, all elements of any system can be treated as subsystems. It is obvious that in systemology, the existence of a minimal subsystem and a maximal metasystem with respect to any system is an open question. It is obvious that the educational system is characterised by a hierarchical structure and functional organisation. For example, from the point of view of education policy, it is important to find out how the lower levels of the education system are coordinated by the elements of its highest management level. On the other hand, there is also an inverse dependence – the activity of the highest level

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of management of the education system depends on how efficiently its subsystems function.

In the teaching/learning process, it is extremely important to understand the importance of the systematicity of knowledge (information). The 21st century poses new challenges for cognition. The analytical knowledge of reality that prevailed in the 9th-20th century is changed by holistic, synthetic, integral/interdisciplinary knowledge. And this is completely understandable because the realisation of educational goals largely depends on how the students were able to master the system of knowledge, abilities, and experience/practice.

> "Knowledge systematisation, by establishing internal and interdisciplinary relations in the teaching process, ensures not only solid, long-lasting knowledge. Knowledge systematisation is of particular importance in deepening knowledge, teaching content provided to students" (Vaitkevičius, 1968).

Systematisation inevitably requires active mental activity (thinking). In such an environment, thinking develops and various ways of cognitive activity are mastered. Thus, students' thinking is an essential instrument guaranteeing effective cognition. On the other hand, the knowledge system must be understood, it must enter the child's thinking and practice (Juodaitytė, 1992). Especially high school students, who often study the foundations of various modern theories, must be able to think at a high level of abstraction. Teachers must not only take care of a didactically based system of students' learning methods but also try to connect this system with increasingly complex theoretical teaching material. Research shows that the proper organisation of practical classes opens up great opportunities for the systematisation of students' knowledge (increasing the efficiency of independent work, developing logical thinking, creative abilities of each student) (Puodžiukaitienė & Šiaučiukėnienė, 1992).

> "The systematisation of knowledge as a process and the creation of a knowledge system as the result of this process is the result of analysis, synthesis, summarisation, comparison, etc. The systematisation of knowledge combines all these thinking operations; therefore, it plays a very important role in the development of students' thinking. At the same time, knowledge becomes a real tool for the development of a student's thinking only when it is combined into a unified system in the student's consciousness, when the student, absorbing it, performs various thinking operations" (Vaitkevičius, 1968).

According to Lee, the systemic approach draws certain boundaries for the integration of separate scientific disciplines (Lee, 2002), what is more, the systemic approach is an instrument for creating an effective learning environment (Biswalo, 2001). This is not to deny the importance of analytical cognition. According to Vaitkevičius, in order to improve the logic of the student's thoughts and their depth, it is necessary to supplement the analytical knowledge of reality with a synthetic one, which can only be achieved by establishing internal and interdisciplinary relationships, forming generalised systems of knowledge at the level of scientific theory (Vaitkevičius, 1979, p. 18). In addition, as Juodaitytė (1999) observes, the potential opportunities for the formation of systemic knowledge at school condition the pedagogue's desire to go beyond the subject because it is the subject-based teaching system that is an obstacle to achieving a more complete understanding of natural and social systems. In addition, the basis of each educational subject is a system of interconnected scientific concepts, the quality of students' knowledge and understanding of the subject depends on their assimilation. (Šlekienė & Lamanauskas, 2019). Following the analogy of general systemology, we could depict two sections of knowledge like this (Figure 2).

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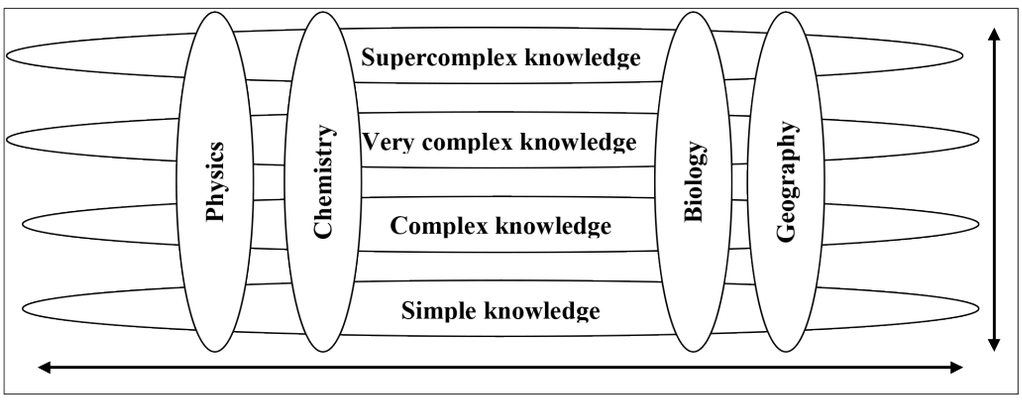
Figure 2
Sections of Knowledge – Subject and Systemic



The systemic approach makes it possible to include the analysed object or phenomenon as a whole, i.e., explaining the most diverse relationships. Although, it goes without saying that individual subjects (areas) are also complex systems with various connections. However, the system is essentially qualitatively different from the simple sum of its constituent elements (parts). It has properties that the individual elements do not have.

Thus, this panoramic view allows us to say that educational systems are always open, they cannot exist without interaction with the environment. The systemic approach should not be understood only as a comprehensive analysis of the system and its structure. A full systemic approach requires knowledge of the environment, in which the system exists. It is also obvious that the assimilation of knowledge/skills in any field largely depends on the competence of the teacher, the teaching methods/ techniques he uses and, of course, on the learning methods used by students and which help to understand the essence of the acquired knowledge, to become aware of it, and to apply it to new teaching/learning situations.

Educational systemology helps to solve complex educational problems, when it is inevitably necessary to connect information from various sciences, to define new areas of research. Education as a multi-level, hierarchical, complex, and developing social system just requires a systemic approach, systemic analysis, and systemic research in general. Applying the systemic approach to the analysis of educational phenomena is important not only in a cognitive sense. When applying a systemic approach, new problems that have not been understood until now come to the fore, and new directions of scientific research are initiated. In the process of education, there is a huge variety of factors that determine education. Often, educational situations and conditions are uncertain. However, there are fundamental issues of education as a system, on the one hand, and education innovations, on the other. From this point of view, the synergy of fundamentality and innovativeness is inevitable. Therefore, applying the achievements of systemology in solving complex educational problems is a promising way.

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