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# Philosophical and Methodological Analysis of the Transformation of Paradigms of Science and Education

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**ABSTRACT:** The article provides a philosophical analysis of nonlinear thinking, shows the relationship of paradigmatic changes in the "science – education" system. The essence of the concepts of instability and nonlinearity in the framework of the theory of synergetics is revealed. The transformation of the paradigm of science and its influence on the model of education is shown. The paradigm of education in a digital society is considered. The position is substantiated that the theoretical and methodological basis of the dynamics of socio-cultural reality is synergetics and nonlinear analysis.

**KEYWORDS:** postmodernism, synergetics, uncertainty, instability, nonlinearity, science, intellectual and cultural transformations, education, science, linear – nonlinear thinking

## INTRODUCTION

The era of postmodernism is characterized by high dynamics of socio-cultural, scientific, technical and technological development. The shifts taking place in the socio-economic and cultural space lead to a change in ontological and epistemological ideas about the world and knowledge about it, and also have a powerful effect on human consciousness, worldview and thinking. It is very important to identify ways of self-preservation of the identity of man and humanity in a situation of total uncertainty, instability of planetary development, socio-economic, cultural and spiritual crises. The methodology relevant to the prevailing social reality can be synergetics and nonlinear analysis. "In terms of its content, the synergetic methodology is close to the main thinking strategies of postmodernism. He develops unconventional ideas about the ways of growth and the nonlinear development of cultural phenomena, the role of decentralization and chaos." (Stepin, 2004)

Deep cultural transformations covering all spheres of human existence involve science and education in this process. "The modern world," according to the position of N.Z. Aliyeva, "is characterized not only by the scale and pace of changes taking place in it, but also by the depth of instability and crisis phenomena. The feeling of instability as a state of the world causes a state of uncertainty, anxiety, intense listening to a disordered world." (Alieva, 2008) The threats that arise in this situation can be resolved or minimized within the framework of a non-linear approach. In this context, the role of natural and technical sciences, humanitarian knowledge, education and culture in general is increasing. Understanding the complexity and ambiguity of modern socio-cultural reality cannot be achieved through the traditional deterministic approach, "linear" thinking, and "linear" analysis. Understanding of this fact is achieved by including a synergetic approach in the cognitive field, which is adequate to the modern methodological culture of thinking. (Bolotina, 2022).

A new breakthrough in the field of information technology has brought human civilization to a qualitatively new level of development, called the digital age, the digital society. A digital person, who is a representative of the millennial generation, buzzers, has joined the creation of a new sociality, a post-social reality. As a result, there are changes in everyday life, industrial relations, the structure of the economy, science and education, in the service sector, and culture in general. Science and education are the basic directions of the development of digital civilization. The state of instability and instability in the new conditions is only increasing. In which directions are threats and challenges seen for the current education system? The following areas can be distinguished here: a) education based on a technocratic model is recognized as more modern and effective; b) abandoning integrity in favor of narrow specialization; c) focusing on the education of countries with an advanced digital economy with its value system; d) changing systemic, consistent thinking to fragmented clip thinking. (Kuznetsova, 2018)

Literature analysis and methods. The general methodological range of research issues has been sufficiently developed in the world philosophical, methodological and scientific-theoretical literature devoted to the analysis of the evolution of paradigms

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of science and education: classical – non-classical-post-non-classical.Philosophical and methodological, theoretical and conceptual aspects of the formation of a nonlinear synergetic paradigm of science, system analysis and principles of nonlinear thinking are considered in the scientific research of I.R.Prigozhin, E.N. Knyazev, S.P.Kurdyumov, S.P., V.Stepin, G.I.Kasperovich, A.P.Ogurtsov. The interrelation of education and science with transformations in socio-cultural reality is revealed in the studies of L.Z.Giniatullin, V.I.Bogoslovsky, A.L.Busygin, V.N.Aniskin, N.Z.Aliyeva, T.F.Kuznetsova. The problem of the formation of nonlinear thinking in the educational process has been studied by researchers L.G.Shestakova, E.Bolotina, S.V.Levina, A.A.Vasiliev, I.N. Pleshchenkov, V.A.Shvetsa, T.F.Ivanova, T.M.Mukhamedova.

To achieve the scientific goal and solve the tasks set, such methodological tools as: synergetics, nonlinearity, analytical - synthetic, comparative-didactic, historical, holistic, generalizing, systemic, interdisciplinary approaches were used.

Philosophical aspects of the post-non-classical paradigm of science and education. The methodological basis of post-non-classical science, philosophy and education is synergetics. Interdisciplinary science reconstructs a person's worldview and thinking. An example of such a modification can be considered a creative approach to education, which contributes to the construction of new forms and meanings – synergetic. "At the same time, synergetics emphasizes the fact that everything in the universe is subject to the rhythms of life, obeying which complex systems can maintain integrity and dynamically develop." (Bolotina, 2022)

The principles of synergetics underpin modern approaches to education: openness, randomness, self-organization, integrity, fractality, attractivity, coherence, chaos-order, emergence, dissipativity, nonlinearity, etc. The inclusion of methodological tools of synergetics in the educational space contributes to the construction of a nonlinear (synergetic) paradigm of education. Nonlinearity implies a variety of promising ways of developing systems of different nature. The choice is made at points of bifurcation, unstable equilibrium, "branching of the old quality into a finite set of well-defined qualities." (Bransky, 1999)

Within the framework of this model of education, a nonlinear style of thinking is formed, which has a number of specific characteristics: firstly, criticality; secondly, logical exactingness, which is expressed in unity with nonlinear thinking; thirdly, abstractness in combination with the ability to detect a correlation between an ideal model and a real process; fourthly, evidence-based and reasonableness, willingness to combine and take into account an alternative position; fifth, focus on the study of the nature of concepts and the essence of phenomena; sixth, fundamentality, an attitude towards discovering deep connections and interdependencies between phenomena and processes of diverse nature; seventh, readiness to act in a situation of instability, crisis, when it is necessary to carefully plan your actions and calculate their possible consequences; eighth, complementarity (unity of conscious and subconscious, rational and emotional, rational and irrational, intuitive). (Shestakova, 2004)

In the context of the dynamics and instability of social reality, the orientation of education towards the formation of critical thinking is of paramount importance. Since we are talking about the development of such abilities as: a) the ability to filter the flow of reverse information; b) the talent to scan the situation, notice details, redundant and missing elements; c) identify logical errors, contradictions, cognitive distortions, manipulative techniques; d) design non-standard and ergonomic solutions; e) have the ability to compare, analyze, draw their own conclusions, as well as be able to defend themselves from unnecessary opinions of others.

The existing challenges and threats on the agenda raise the issue of the introduction of quantum thinking through the education system. Quantum thinking is the ability to be in a state of openness and flexibility, to abandon stereotypes and prejudices. Awareness of the fact that reality is not something stable and unchangeable, but rather a process of continuous change and transformation, i.e. a state of uncertainty. Quantum thinking is the ability to see a problem from all sides, setting up a pluralism of opinions. (Godlevskaya, 2023)

The post-non-classical interpretation of education arises in the context of the changes that have occurred in science and philosophy. Modern science builds a heuristic model of instability and introduces new principles and methods of thinking directly into education. One of the most radical changes is a new interpretation of thinking, which is now understood as a non-linear process. The concept of non-linearity is used very widely today, it acquires a philosophical meaning. The idea of nonlinearity includes multivariance, the alternative choice of the paths of evolution and its irreversibility. Nonlinear systems are influenced by random (fluctuation), small impacts generated by disequilibrium.

The former classical understanding of thinking is a linear process, a linear chain of reasoning, a deductive-axiomatic method of presentation, as in Euclidean geometry. This linear thinking still dominates the modern education system. The new non-linear thinking, as opposed to linear, can be interpreted as a non-linear organization of acts of reasoning, discourse as an analysis of acts

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of sense-setting and sense-comprehension. Such a non-linear process includes not only "breaks", but also "breakthroughs" to understanding. Post-non-classical education is in the process of formation in the context of an open and developing dialogue and communicative interaction with culture against the background of the development of modern digital civilization, techno-scientific culture, modern high information technologies, and the knowledge industry.

Today, in developed countries, the education system is turning into a leading branch of human activity. The sphere of education, the field of scientific research, technical developments, telecommunications and computer activities, mass media, printing and libraries – in these fields of activity, in this industry of knowledge in modern conditions, more than half of the national product of highly developed countries is produced. Thus, our study reproduces the logic of the movement of post-non-classical theoretical thought aimed at understanding the key idea of instability in theoretical concepts for the period under consideration, and at affirming this idea in nonlinear (chaotic) educational strategies. The modern world, characterized by instability, variability, and rapid change of information, forces us to take a fresh look at the problem of education. In modern realities, when it comes to the rapid development of high–precision and knowledge-intensive technologies, it becomes especially clear that the main wealth of mankind is the production, distribution and consumption of knowledge. (Giniatullina, 2004)

However, the world does not stand still, the face of science is changing, accordingly, this leads to a transformation of the educational paradigm, the training system capable of joining the modern production system in the future. Today, humanity has already entered the era of digital civilization. The educational process in this digital space differs from the traditional one. Classical education focused future specialists on linearity, consistency of thinking, single-tasking, searching for the right information, reading and mathematical literacy. Non-classical education is aimed at forming a different mindset among the generation of the digital age, which is characterized by hyperlinking, searching for connections between information, multitasking, cutting off unnecessary information, creativity, information and data literacy, criticality.

Researchers V.I.Bogoslovsky, A.L.Busygina, V.N.Aniskin suggest calling a non-classical type of education information and digital education. This education pursues the following goals: a) the formation of functional digital information literacy: knowledge, skills, competencies, in general, digital competence and culture of educational subjects; b) the development of adequate ideas about the information picture of the world and the essence of socio-economic processes that meet the requirements of digitalization of society; c) to stimulate the desire for self-development and self-education in the information sphere in the context of the digitalization of the economy; d) the formation of a system of personal information values and motivations, the development of individuality in the information sphere. (Bogoslovsky, Busygina, Aniskin, 2019 )

In the new conditions, there is an increased interest in continuing education, which is based on the principle of "lifelong learning", i.e. we are talking about the fact that a person should be ready to change his professional activity based on the demands of the digital market. "A continuous process of learning and personal development aimed at forming a system of scientific and practical knowledge, skills and competencies, value orientations, behavior and activities that allow a person to actively and effectively perform their official duties in a digital educational environment and the digital economy of a modern information society. (Bogoslovsky, Vasiliev, Pleshchenkov, 1998)

Education should put non-linearity of thinking at the center of its philosophy, presenting it as a set of communicative acts, as a discourse. This way of thinking is in tune with global digital technologies, which not only provided computer and Internet users with electronic forms of communication, but also taught new forms of working with texts in electronic form, in particular, intertextuality, discourse within the global information network. The research and experimental essence of innovative educational strategies appears as an integral cultural phenomenon, internally connected by the cross-cutting idea of instability and nonlinearity, manifested in different spheres of culture. Modern education is actually focused on replacing the traditional linear deterministic thinking with a new, non-linear (indeterministic) one by removing various restrictions. (Shvetsova, Pchelkina, 2017)

Changes in the intellectual sphere manifest themselves in a sense of instability as a permanent state of the world, acceptance of the thesis of the chaotic world, "from which all philosophical doubts follow, pushing for a close study of the centuries-old cultural tradition of thinking, which combined meaning exclusively with order." (Dobritsina I.A., 2007) Acceptance of the thesis of the chaotic world leads to the growth of chaotic elements in public consciousness and culture. This leads to all philosophical doubts, loss of ideological guidelines and moral rules. All systems of modern culture reflect this stage of increasing instability, uncertainty, and chaos. An education that continues the classical tradition of learning in line with the centuries-old cultural tradition of thinking, which combined meaning exclusively with order, only supports an existential longing for order, but does not teach living in a modern

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unstable world. The main parameters of the studied systems are: openness, self-organization and nonlinearity. Chaos plays a key role in nonlinear systems. The fundamental work of I.R.Prigozhin and I.Stengers "Order from Chaos" is a confirmation. (Prigozhin, Stengers, 2000). It was this work that gave impetus to the formation of the post-non-classical paradigm of science, which was subsequently extrapolated to other objects of culture and education. (Levina, 2020).

The specificity of the new paradigm of science is expressed in the following: a) it is based on the principles of new rationality, instability, inequality, formation, complexity, fractality; b) instability, evolution and fluctuation are determined by the basic characteristics of natural and social processes; c) open, non-equilibrium, complex systems with the ability to self-organize become objects of research; d) coherent motion arising in complex systems is capable of generating movement from chaos to order, followed by the formation of structures; e) the presence of bifurcations fixes the multiplicity of possible paths of evolution. (Ogurtsov, 2006)

The idea of considering instability, chaos as an invariant and constant of the world appears in the modern culture of digital society equally before all spheres of society, including science, art, philosophy, education. Almost simultaneously, a paradigm shift begins in different forms of spiritual experience, the process of forming the concept of nonlinearity, instability, chaos and the development of their modern methodology.

In the science of the last century, new concepts of nonlinearity and chaos appeared, corresponding to the idea of instability. Numerous phenomena of self-organization in different spheres of nature and society have been discovered. They were described by the mathematical theory of nonlinear dynamics, fractals, synergetics, the theory of dissipative structures, the theory of autopoiesis, the science of complexity and mutual transitions of the "order-chaos" type. Mathematical developments related to the construction of fractal geometries have also been included in the foundations of a new scientific model of the world, in which instability and chaos are embedded in the process of world evolution and are assessed as its main driving force.

From this moment on, science, in the refraction of synergetics, removes the mechanism of self-organization of complex systems in states of instability from states far from equilibrium. The unstable chaotic state of the system is considered in science as a creative phenomenon that contributes to the accumulation of a wide variety of possibilities for the development of this system, i.e. providing a set of scenarios, a range of structures for its further development. Chaos is a way of updating a complex organization not only in nature, but also in the human mind. Modern cognitive science presents the process of inactivated cognition as the emergence of emergent cognitive structures based on chaos. This understanding of chaos is consonant with the philosophical ideas of the ancient East: "Chaos is considered not as the disintegration of what was created, but as infinity, as the possibility of endless creativity over and over again." (Knyazeva, Kurdyumov, 2007)

The concept of instability establishes a new attitude towards the world: "We did not choose the world that we have to study; we were born into this world and we should perceive it as it exists, adapting our a priori ideas to it as much as possible. Yes, the world is unstable. But this does not mean that it is not amenable to scientific study. Recognition of instability is not a capitulation, on the contrary, it is an invitation to new experimental and theoretical research that takes into account the specific nature of this world." (Prigozhin, 1991). French sociologist and cultural critic Edgar Morin believes that humanity must learn to represent order and disorder in wholeness, harmony. In science, special attention is paid to the dialogue with randomness. In order for the dialogue to be constructive and fruitful, it is very important to understand that order is relative and disorder is uncertain. "We must start a dialogue between these categories, each of which, like an echo, resonates in the opposite, each of which is inseparable from the opposite and complements it, being in opposition to it." (Ilyin I.P., 1996). Humanity needs to learn how to resist the process of chaoticization of the world, the endless growth of innovation and the emergence of crisis events of various scales. From this point of view, it is advisable to form large-scale, systemic thinking of an integral, nonlinear and dialogical nature.

## CONCLUSION

Modern social reality has created conditions for the development of information and digital space in society. In this situation, there is a tendency for new paradigms of science and education to emerge, in which synergy plays a key role, i.e. the coordinated interaction of all components of a complex system. The concepts of instability and nonlinearity, which have recently become the focus of attention, find their application both in the natural sciences and in the humanities. They are essential for the unstable world described by the theory of dissipative structures, the theory of chaos. These concepts are essential for understanding any area involved in the social system. The points of view of representatives of various scientific disciplines intersected on the conceptual

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horizon, where the dominant concept is stability - instability, order - chaos, which led to a consensus based on the philosophy of the dialogical interpenetration of chaos and space, associated with the establishment of a new cultural, educational and scientific paradigm.

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