



Educational models and technologies used in fractal pedagogy

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Abstract: The article presents the theoretical and methodological prerequisites for the formation and development of fractal pedagogy. In addition, the scientific justification of the principles of fractal pedagogy, its features and principles are considered and given. The result of the research is to determine the structure of personal and professional self-development of the teacher (motivational, design, activity-practical, reflexive, emotional volitional components). The presented research is considered as a variant of understanding the problem of personal and professional self-development of a teacher from a new perspective. Fractal methodology applicable to the problem of self-development of the teacher can be the Foundation for various psychological and pedagogical research in their perspective.

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1. Introduction

Innovative development of Uzbekistan acts as a tool for the development of modernity, where the key idea is the formation of human capital, therefore, for its formation it is necessary to support all stages of education, mastering all the best that has developed in world educational practice, and directing efforts to create a fundamentally new education system focused on the needs of post-industrial society of the XXI century. To solve this problem, it is advisable to turn to the characteristics that determine the innovative development of modern society, the main of which are:

- * maximum flexibility and non-linearity of organizational forms of production and social sphere;

- * inclusion of the processes of obtaining and updating knowledge in all production and social processes;

- * reliance on human talent, creativity and initiative as the most important resource for economic and social development;

- * multiple, often unpredictable changes in technologies (including social ones) over short periods of time;

- * changing the foundations of social positioning – from material capital and a once-mastered profession to social capital and the ability to adapt;

- * the presence of two innovation circuits, the first of which is associated with the generation and promotion of innovations, and the second with their selection and development.

From the presented characteristics, new requirements for the results of education follow, and the most important of them is the request for a creative personality. In the work devoted to the portrait of a creative personality, Professor G.A. Davis identifies a number of her qualities:

- 1) awareness of creativity - manifests itself in the fact that a person evaluates novelty, his own creative potential, the possibility of achieving a creative goal;

- 2) originality - implies flexibility in ideas and thoughts, resourcefulness, unconventionality, unusual, willingness to challenge assumptions, the possibility of action based on the principle of "what if..?";

- 3) independence, self-confidence (assertiveness), internal manageability, individualism, adherence to a set of own rules, independence of decisions, resistance to external requirements;

- 4) riskiness – the desire for novelty, the sharpness of sensations, the ill-considered consequences of spontaneously made decisions, a dispute with failure, optimism;

- 5) energetic - enterprising, striving for sensation, enthusiasm, hyperactivity, hyperexcitability, spontaneity, absorption in action;

6) artistry – acting abilities, eccentricity, the desire to recognize the importance of one's personality;

7) interest, questionability, experimentation, curiosity, openness to new experiences and growth;

8) having a sense of humor – playfulness, manipulation of ideas, sincere freshness in thinking;

9) craving for complexity – fascination with novelties, mysterious, asymmetric; tolerance for ambiguity, disorder, incompatibility;

10) open-mindedness, receptivity to other points of view, liberality, altruism;

11) the need for solitude – the desire to work alone, secrecy of needs, reflexivity, introspection, inner concern, sensitivity, increased anxiety;

12) intuitiveness – insight, the ability to insight, the possibility of premonition and foresight [253].

Building the scientific concept of "fractal pedagogy", we were based on philosophical propositions about man as a bio-psycho-sociocultural existential phenomenon (Aristotle, E. Huserl, G.V. Leibniz, A.E. Kazachinsky, M. Mamardashvili, F. Nietzsche, V.I. Slobodchikov, V.N. Sagatovsky, V. Frankl, M. Heidegger, etc.), investment theory of creativity (R. Stenberg, T. Lubart, etc.), theories of self-organization (V.I. Arshinov, V.G. Budanov, M.G. Gapontseva, E.N. Knyazeva, S.P. Kurdyumov, V.S. Stepin, N.M. Talanchuk, V.A. Fedorov, I.R. Prigozhin, G. Haken, etc.), theories of fractals (V.E. Voitsekhovich, B. Mandelbrot, V.V. Tarasenko, S.D. Khaytun, etc.), noospheric (G.M. Komarnitsky, N.V. Maslova), health-creating (V.V. Kolbanov, A.G. Majuga, N.N. Malyarchuk, I.A. Sinitsina, G. Spencer, L.G. Tatarnikova, S. Frenet) and holistic types of education (S.A. Amonashvili, A.V. Voznyuk, L.S. Vygotsky, A. Maslow, J. Miller, M. Montessori, K. Robinson, I. Pestalozzi, Plato, K. Rogers, J.J. Rousseau, A.I. Subetto, F. Froebel, R. Steiner, etc.).

The study of fractal pedagogy involves the construction of certain educational models that set goals and a scheme of education that determine teaching and learning activities. Educational models act as an educational system that integrates the general goals and content of education, the design of curricula and programs, the private goals of managing the activities of students, models of grouping students, methods of control and reporting, methods of evaluating the learning process.

The educational model used within the framework of the conceptual ideas of fractal pedagogy is a facilitation-resonance model that promotes the formation of nonlinear, fractal-holographic thinking of students and their formation as active constructors of their own life. Within the framework of the described model, it seems possible to offer innovative educational technologies adequate to its content. In

our opinion, the essential characteristics of these technologies are:

The principles of integrity and consistency, which are expressed in the fact that the educational process:

- * has a personal orientation and is a process of continuous moral choice based on personally significant values, as well as optimal natural development of all spheres of personality - cognitive, moral-volitional, active-creative, emotional;

- * it is carried out under the mutual influence of the educational environment and an independent process of self-development, cultivation of a free, self-valuable person with a defining (active) role of the individual;

- * occurs under the influence of external and internal factors. The external factor is the educational environment as the socio-cultural environment of the student, the conditions of his life with the priority of the productive component of education, expressed in the creative function of the student. Internal factors are the processes of identifying the value unity of internal and external from the standpoint of the study of their meanings, meaning, essences, which lead a person to the ability to self-form problem thinking as a prerequisite for theoretical thinking, allowing him to realize the meaning and content of universal values, transform them into personally significant priorities of life and activity.

Regularities of the educational process:

- * education, addressed to the personality of a person through the creation of conditions for the pedagogical demand of personal qualities, naturally contributes to the process of self-identification and the formation of the subjective position of students;

- * the interrelation of personal lines of development: education-self-education, professionalization-self-development, individualization-socialization in the system of continuing education naturally creates conditions for the formation of the subjective position of students;

- * compliance with the humanistic principles of personality-oriented education naturally determines the disclosure of the creative potential of the individual.

Humanistic principles of educational models that contribute to the formation of a subjective position based on the student's personal involvement:

- * enriching influence of the educational environment while preserving uniqueness, identity and individuality, taking into account the uniqueness of individual needs, capabilities and abilities;

- * priorities of the intrapersonal content of education formed in the process of passing an individual educational trajectory;

- * prioritization of the productive component of education based on the development of the need to implement the creatively transformative essence of activity;

- * self-actualization and reflection, evaluation and self-assessment of activities. A set of pedagogical conditions that contribute to the formation of the subjective position of students:

- * the relevance of the student's personal qualities in the educational process;

- * the diversity and multifunctionality of the content of education, pedagogical technologies, forms of control are adequate to the diversity of needs, inclinations and abilities of an individual, aimed at mastering the culture of a healthy lifestyle, creativity, communication, civil law;

- * procedural educational technologies within the framework of subject-subject relations focused on self-realization, meaning-making activity of students, providing subjective appropriation of the content of education;

- * granting the subjects of the educational process the right of free choice in the educational field and building their own educational trajectory.

At the level of pedagogical technology, the fractal resonance approach to education can be characterized as education: "the training procedure, the method of communication between the student and the teacher, the student and the teacher is not the shifting of knowledge from one head to another, not broadcasting, enlightenment and presentation of ready-made truths. This is a non-linear situation of open dialogue, direct and feedback, educational adventure, falling (as a result of solving problematic situations) into one self-consistent world. This is a situation of awakening the student's own powers and abilities, initiating him to one of his own paths of development. Education is stimulating or awakening education, self-discovery or cooperation with oneself and other people" [5, p. 73]. Self-development in a rapidly changing socio-cultural environment is one of the main compensations, since an actively developing specialist is able to meet the modern problems and new requirements of the professional environment. Philosophical understanding of the problems of our time allows us to formulate this article: all that is known about the future is not known how it will be. In this regard, it is necessary to train a specialist to act in conditions of uncertainty. The effectiveness of solving non-standard tasks under constantly changing conditions is directly related to the process and results of personal and professional self-development.

Digitization of society and the emerging global information network fundamentally change the processes of personal development and self-develop

define their characteristics and dominant vectors. Self-development of the teacher takes place in the macro - system of integrated education environment-the macro-system of interaction microeconomics, opportunities and interpretations. The process of personal and professional self-development of the teacher in the conditions of the educational system is fractal in nature.

The goal. Identification of the methodological bases of fractal Organization of the process of personal and professional self-development of the teacher in improving the modern educational process, development of fractals classification, self-development process.

In modern environmental conditions, there is an opportunity to consider the teacher's self-development problem in a new way, to determine the prospects of the teacher in modeling and designing the process of personal and professional self-development.

A brief analysis of the scientific works of other scientists on the topic. The self-development of the teacher should be based, first of all, on the content of motivating changes and the implementation of this process. The notorious psychologist V. Frankl considered the desire of a person to seek and realize the meaning of his life as a characteristic motivational feature for all people. V. Frankl argued that it is impossible to give meaning, it is necessary to find it. Having understood the meaning, a person realizes himself: "the self-realization of a person occurs on his own—not as a goal, but as a result of the realization of the meaning" .

Fractal (Latin fractus - crushed, broken, broken) is a geometrical form, in which a certain part is repeated repeatedly with changes in size. Researchers of this new field believe that the father of the theory of fractals is Fronka-American mathematician professor Benue Mandelbrot (born in France). In the last decade of the 1960s, Mandelbrot called his scientific work "fractal geometry" or "nature geometry" (about which he writes in his work "fractal geometry of nature" - "The fractal geometry of nature"). The purpose of fractal geometry is the analysis of broken, twisted and irregular shapes. B.Mandelbrot used the word fractal for these forms, consisting of fragments and parts.

B.Mandelbrot other scientists Clifford A.Pikkover (Clifford A.Pickover), James Gleick (James Gleick) or G.O.Peytgen (H.O.Peitgen) kengaytirishga moves the field of fractal geometry, that is, from predicting the prices of securities in the market to the practical application of them all over the world, to the fulfillment of new discoveries of Theoretical Physics.

Fractals are often used in science. The main reason for this is that it very accurately describes the

existence in relation to traditional physics or mathematics.

The scientific essence of the article. Fractal in general terms is a structure in which the main properties are self-similarity and repeatability, that is, fractals are collections that have self-similarity. Self-similarity is expressed by the presence in the general form of a replicated element—a fractal (self-similar structure). In other words, the Fractal can be defined as an infinitely similar geometrical form, each of which is repeated with a reduction in the fraction. Thus, the tree horn is similar to the tree itself, so the tree has a fractal structure. Fractals are one of the subjects of the study of synergetics, it examines complex self-organizing systems, and the researcher needs to be structured in order to initially perceive the object under study as a fractal structure corals, starfish, shells, flowers, bronchi, blood vessels, nervous system and many other living nature objects have a clear fractal structure. A vivid example of this is the program of hereditary development, which is absorbed into the genes and is included in the composition of all cells, each of which can multiply the whole organism, similar to the original one. Chemical elements that change their properties depending on the charge of molecules and atoms, their atomic nuclei, crystal lattice and chemical bonds are fractal in their essence. Clouds, seashores, lightning, snowflakes, frosty patterns and other inanimate phenomena are also fractals.

2. Methodology

Fractal multiplies itself in these objects at each subsequent level on a smaller scale. Many natural objects are distinguished from ideal mathematical fractals by the fact that the structure is not repeated and inaccurate; in this sense, natural structures are quasi-fractals. To the greatest extent, fractal ideas are used precisely and in natural sciences. But the feature of similarity is possessed not only by Fractal mathematical collections and natural objects, but also by socio-cultural phenomena. It is known that currently, fractals are widely used in computer graphics, physics, and various other natural sciences, as well as in the design of antennas in radio engineering, in the processing of signals in telecommunications, as special effects and visualization elements in film and television, in the light industry, in the drawing of patterns for modern designs on fabrics and carpets, etc. In other words, fractals exist everywhere.

The principle of fractality is attributed to many social processes, in this sense it is possible to characterize any side of life on the basis of fractal nature. Examples of the Fractal Organization of socio-

cultural systems: words, texts, music, patterns, Russian houses and the architecture of the eastern pangodas, cities and neighborhoods in them. The multifaceted nature of the objects, phenomena and systems in the list emphasizes that the fractal contains everything. To characterize the disproportionate fractal of socio-cultural systems and objects, we use the term “conceptual fractal”. The conjugal fractal is expressed in the form of socio-cultural practice in the conditions of a particular culture. The similarity of the conjugal fractal itself is revealed at the level of concepts, ideas, conceptions, mental constructions, configurations, as well as relations between them. Conceptual fractal self-multiplying at all levels and scales of a certain degree of structure. In such a structure, the concept fractal is the creator algorithm of the organization. On a Global scale, one can argue that the whole socio-cultural world is a congestive fractal.

The idea of fractals in technical sciences is not a novelty. Hence, in different science based on fractal methodology, different levels on it is based on the similarity of social systems, the cyclical nature of trends and the legitimacy of events are considered, socio-political and other fractal models are created.

The methods used in the study. The study of the sociological process of personal and professional self-development of the teacher in the modern educational process is based on fractal methodology. In science, this methodology is used in the study of objects characterized by instability and randomness of connections between structures and components. The philosophical and methodological basis of the study is the fractal and chaos ideas in the dynamical systems, while fractal and randomness are regarded as a single integral process.

When we talk about the Fractal methodology of the process of personal and professional self-development in the improvement of the modern educational process, we understand the set of ideas and worldview positions that underlie the personal and professional scientific and pedagogical development of the teacher based on the consideration of this process from the point of view of the theory of fractals. The leading approach to the study of fractal Organization of the process of personal and professional self-development of the teacher in the modern educational process is an integrated-ecological methodological approach. This approach allows to better understand the essence of fractal Organization of self-development of the teacher in modern environmental conditions. Building the scientific concept of "fractal pedagogy", we were based on the philosophical positions about man as a bio-psycho-socio-cultural existential

phenomenon (Aristotle, E. Huserl, G. V. Leibniz, A. E. Kazachinsky, M. Mamardashvili, F. Nietzsche, V. I. Slobodchikov, V. N. Sagatovsky, V. Frankl, M. Heidegger, etc.), the investment theory of creativity (R. Stenberg, T. Lubart, etc.), theories of self-organization (V. I. Arshinov, V. G. Budanov, M. G. Gapontseva, E. N. Knyazeva, S. P. Kurdyumov, V. S. Stepin, N. M. Talanchuk, V. A. Fedorov, I. R. Prigozhin, G. Haken, etc.), theories of fractals (V. E. Voitsekhovich, B. Mandelbrot, V. V. Tarasenko, S. D. Khaytun, etc.), noospheric (G. M. Komarnitsky, N. V. Maslova), health-creating (V. V. Kolbanov, A. G. Majuga, N. N. Malyarchuk, I. A. Sinitsina, G. Spencer, L. G. Tatarnikova, S. Frenet) and holistic types of education (Sh. A. Amonashvili, A. V. Voznyuk, L. S. Vygotsky, A. Maslow, J. Miller, M. Montessori, K. Robinson, I. Pestalozzi, Plato, K. Rogers, J. J. Rousseau, A. I. Subetto, F. Froebel, R. Steiner, etc.).

The essence of the integrated environmental approach lies in the holistic combination of different components that were previously separated. The integration-ecological approach is based on the understanding of the unification of the educational environment as a unit of their diversity, thereby creating a new object with the emerging qualities and potential opportunities of the elements, their relations and relationships. In the research presented in the article, pedagogy is also used in the connection of Science with social (psychology, philosophy, etc.) and technical sciences (computer graphics, engineering graphics, etc.). The methodological basis of such a connection between technical and Social Sciences, in particular pedagogy, is an integrated environmental approach. The establishment of such a scientist-teacher relationship is qualitatively different, at a high level it allows the teacher to substantiate the use of fractal methodology in the study of personal and professional self-development. In obtaining the results of the study, scientific methods such as analysis, synthesis, abstraction, generalization, classification and others were used.

Results and practical examples. At the formal-semantic level, fractal self-development (self-development, self-management, self-efficacy, self-introduction, self-organization, self-regulation and other components of the self-management system) can be identified. The concept of "self-" introduces the following concepts into complex concepts: the direction of the action in relation to itself; the involuntary, independent execution of the action. For example, a modern teacher has the quality of self-management and is the initiator of a continuous independent educational movement.

It should also be noted that the existing concept of "self" is interpreted as an expression of the psychological integrity of individuals, and by combining the conscious and unconscious parts of the psyche, selfishness distinguishes the individual from the surrounding world. It should be said that the importance of the concepts of "self-management" is defined as the ability of higher education to establish and implement the priorities of its activities, in particular, self-organization and self-development, as well as methods of improving it on the basis of self-esteem, in the state educational standards.

Thus, it can be understood that the group of concepts "self-" is the only system that combines the psychological concepts of a homogeneous structure with two common features:

- the meanings they describe have a psychological character;
- the subject and object of the described activity belong to the same system.

At the same time, these concepts are multifaceted, not similar to each other, and the selected fractal "self-" only formally expresses their essence.

The result of the research presented in the article is to determine the Fractal essence of the teacher's personal and professional self-development process, to determine in the context of integrated education and to develop the classification of fractals on this basis and the environment in which this process is carried out.

The developed classification of fractals is based on the following.

- * structural and procedural parts of personal and professional self-development of the teacher;
- * the structure of the integrated educational environment in which the teacher's self-development process is carried out;
- * opportunities and resources of professional development integrated learning environment.

As a result of this study, the main conceptual fractals of the teacher's personal and professional self-development process, structural fractals of the integrated learning environment, as well as the phenomenon fractals of the teacher's self-development in this environment were identified. The fact is that the selected fractals are congruent fractals, their mutual similarity at the level of concepts and ideas, and also reveals the existing relationships between them.

The main conceptual fractal. V. Based on the ideas of Frankl, it can be argued that the personal and professional self-development of the teacher is of a figurative nature, and the meaning is the driving force of the process of self-development. The teacher

himself creates a developing environment, unites his Resources personally with important meanings.

In this regard, it is appropriate to talk about akmeology of meaning - a system of views, knowledge and ideas about understanding the meaning of personal and professional self-development in conditions of a dynamic environment. Akmeology of meaning is the main vector that determines the personal and professional self-development of the teacher

The personal and professional self-development of the teacher includes motivational, designing, practical-activity, reflexive and emotional-willed procedural components. Corrective actions of personal and professional self-development determine the implementation of this process on the principle of concentricity, as a result of which in the circle there is a transition to new levels of development, that is, self-development has a permanent feature (Figure 1).

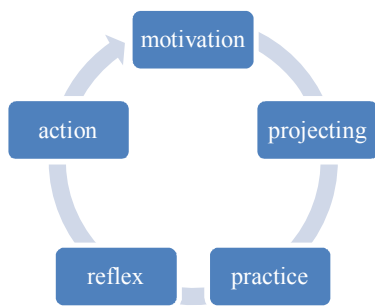


Figure 1. Structure of personal and professional self-development of the teacher (compiled by the author)

3. Realization of the concept

Structural fractals. An integrated vocational-developmental learning environment is an open system that provides unlimited opportunities for the teacher to develop himself / herself as a person and as a specialist. The Global system is fractal in its essence, such as the macromuhide fractal measure. The integrated educational environment reveals its fractal structure, turns into a self-organizing fractal formation. It should be noted that the Fractal in the classical sense is a spontaneous infinite repetition, a geometrical form in which each subsequent element repeats the previous one on a changed scale. Unlike this concept, the conceptual fractals are expressed in the form of socio-cultural practice, without having any algebraic or mathematical resemblance. Conceptual fractal analogy manifests itself in the form of concepts or projects of a rational type.

As a result of the latest processes of digitization and the globalisation of education, it determines the

practical limitless possibilities for the personal and professional development of teachers. Under these conditions, digitization for Fractal micromuhites has a variety of processes, the essence of which can be expressed as the presence of significantly different trends in their formation and development. At the same time, the process of anti-dependence occurs for micromuhites. The elimination of the differences between them is carried out by digitizing all areas of education in a global sense.

Phenomenon fractals. Eventual fractals are stable infinitely reproducible elements, which are transformed into personally meaningful meanings of the possibilities and resources of the integrated professional development environment, the process of self-development. Such phenomenon fractals are used by the teacher for the purpose of self-development. In phenomenon fractals there is an element of coincidence. Event fractals in chaos also allow you to find the connection between events and serve as the basis for the creation of the micro environment of the teacher himself. Such a space was created as systems of selection of many professional development opportunities of a cohesive learning environment. In this case, it is important, first of all, to formulate the ability of the teacher to manage event fractals for self-development.

In the creation of individual professional development trailers of the teacher, the options for the future direction on the basis of event fractals, “points of bifurcation” should be indicated. In this case, bifurcation is understood as a networking point of self-development pathways. When it comes to the point of bifurcation, it is possible to choose possible directions for personal and professional self-development. Thus, a prediction based on possible future options is a means of forming a social reality, in particular the results of personal and professional self - development based on the eventual fractals of the integrated educational environment of the teacher.

Clear conclusion and practical suggestions. Thus, the Fractal methodology allows a deeper understanding of the essence of self-development, its implications and procedural foundations. The methodological basis of the personal and professional self-development of the teacher identified as a result of the study could be the main guide to the construction of the teacher's skills training tray using the Fractal theory laws. Such a vision will significantly improve the integrated education system of the teacher as a specialist in the process of self-development.

The pedagogical component of the study is to motivate the teacher at all stages of his / her personal and professional self-development – reflection of his /

her own development. The process of self-development of the teacher is based on the improvement of self-professional skills. At the same time, advice and methodological assistance can be provided in carrying out this process.

In improving the modern educational process, the main tasks of supporting the self-development of the teacher as a professional person are:

- * provide advisory assistance in the design and implementation of a personal and professional development strategy based on fractal methodology;

- to help the teacher in diagnosing the process of self-development and analyzing its results.

Thus, as a result of the research conducted, not only the Fractal methodology of personal and professional self-development of the teacher in the modern educational process, but also the self-development of fractals and the classification of the environment in which this process is carried out were developed.

In the modern educational process, the teacher does not require a complete description of the Fractal essence of personal professional self-development, but is regarded as an opportunity to understand this problem from a new point of view. The presented fractal methodology the subject under study may be the basis for conducting various research in the future.

Discussion of results

The innovative development of Uzbekistan acts as a tool for the development of modernity, where the key idea is the formation of human capital, therefore, for its formation it is necessary to support all stages of education, mastering all the best that has developed in the world educational practice, and directing efforts to create a fundamentally new education system focused on the needs of the post-industrial society of the XXI century. To solve this problem, it is advisable to turn to the characteristics that determine the innovative development of modern society, the main of which are:

- maximum flexibility and non-linearity of organizational forms of production and social sphere;
- inclusion of the processes of obtaining and updating knowledge in all production and social processes;
- reliance on human talent, creativity and initiative as the most important resource for economic and social development;
- multiple, often unpredictable changes in technologies (including social ones) over short periods of time;
- changing the foundations of social positioning – from material capital and a

once-mastered profession to social capital and the ability to adapt;

- the presence of two innovation circuits, the first of which is associated with the generation and promotion of innovations, and the second – with their selection and development.

From the presented characteristics, new requirements for the results of education follow, and the most important of them is the request for a creative personality. In the work devoted to the portrait of a creative personality, Professor G. A. Davies identifies a number of her qualities:

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- 4) riskiness – the desire for novelty, the sharpness of sensations, the ill-considered consequences of spontaneously made decisions, a dispute with failure, optimism;

- 5) energy – enterprise, the desire for sensation, enthusiasm, hyperactivity, hyperexcitability, spontaneity, absorption in action;

- 6) artistry – acting abilities, eccentricity, the desire to recognize the importance of one's personality;

- 7) interest, questionability, experimentation, curiosity, openness to new experiences and growth;

- 8) having a sense of humor – playfulness, manipulation of ideas, sincere freshness in thinking;

- 9) craving for complexity – passion for novelties, mysterious, asymmetric; tolerance for ambiguity, disorder, incompatibility;

- 10) open-mindedness, receptivity to other points of view, liberality, altruism;

- 11) the need for solitude – the desire to work alone, secrecy of needs, reflexivity, self-contemplation, internal concern, sensitivity, increased anxiety;

- 12) intuitiveness – insight, the ability to insight (insight), the possibility of premonition and foresight [2,5,3].

The study of fractal pedagogy involves the construction of certain educational models that set the goals and scheme of education that determine teaching and learning activities. Educational models act as an educational system that integrates the general

goals and content of education, the design of curricula and programs, the specific goals of managing the activities of students, models of grouping students, methods of control and reporting, methods of evaluating the learning process.

The educational model used within the framework of the conceptual ideas of fractal pedagogy is the facilitation-resonance model, which contributes to the formation of nonlinear, fractal-holographic thinking of students and their formation as active constructors of their own life activity. Within the framework of the described model, it seems possible to offer innovative educational technologies that are adequate to its content. In our opinion, the essential characteristics of these technologies are the principles of integrity and consistency, which are expressed in the fact that the educational process:

- has a personal orientation and is a process of continuous moral choice based on personally significant values, as well as optimal natural development of all spheres of personality – cognitive, moral-volitional, active-creative, emotional;

- it is carried out under the mutual influence of the educational environment and an independent process of self-development, cultivation of a free, self-valuable person with a defining (active) role of the individual;

- occurs under the influence of external and internal factors. The external factor is the educational environment as the socio-cultural environment of the student, the conditions of his life activity with the priority of the productive component of education, expressed in the creative function of the student. Internal factors are the processes of identifying the value unity of internal and external from the standpoint of the study of their meanings, meaning, essences, which lead a person to the ability to self-form problem thinking as a prerequisite for theoretical thinking, which allows realizing the meaning and content of universal values, transforming them into personally significant priorities of life and activity.

Regularities of the educational process:

- education, addressed to the individual through the creation of conditions for the pedagogical demand of personal qualities, naturally contributes to the process of self-identification and the formation of the subjective position of students;

- the interrelation of personal lines of development: education–self-education, professionalization–self-development, individualization–socialization in the system of continuing education naturally creates conditions for the formation of the subjective position of students;

- compliance with the humanistic principles of personality-oriented education naturally determines

the disclosure of the creative potential of the individual.

- Humanistic principles of educational models that contribute to the formation of a subjective position based on the student's personal involvement:

- enriching influence of the educational environment while preserving uniqueness, originality and individuality, taking into account the uniqueness of individual needs, capabilities and abilities;

- the priority of the intrapersonal content of education formed in the process of passing an individual educational trajectory;

- prioritization of the productive component of education based on the development of the need for the implementation of the creatively transformative essence of activity;

- self-actualization and reflection, evaluation and self-assessment of activities. A set of pedagogical conditions that contribute to the formation of the subject position of students:

- the relevance of the student's personal qualities in the educational process;

- the diversity and versatility of the content of education, pedagogical technologies, forms of control are adequate to the diversity of needs, inclinations and abilities of an individual, aimed at mastering the culture of a healthy lifestyle, creativity, communication, civil law;

- procedural educational technologies within the framework of subject-subject relations focused on self-realization, meaning-making activity of students, providing subjective assignment of the content of education;

- providing the subjects of the educational process with the right of free choice in the educational field and building their own educational trajectory.

At the level of pedagogical technology, the fractal-resonant approach to education can be characterized as education: "the training procedure, the method of communication between the student and the teacher, the student and the teacher is not the transfer of knowledge from one head to another, not broadcasting, enlightenment and presentation of ready – made truths. This is a non-linear situation of an open dialogue, direct and feedback, an educational adventure, falling (as a result of solving problem situations) into one self-consistent world. This is a situation of awakening the student's own powers and abilities, initiating him to one of his own paths of development. Education is a stimulating or awakening education, self-discovery or cooperation with oneself and other people" [5, p. 73].

It should also be said that hemispheric synthesis as a psychophysiological goal of human development allows us to achieve the unity of two opposite

behavioral strategies of a person – passive and active, which in the system of holistic, synergetic education takes the following form: "It is not the subject who gives recipes and manages a nonlinear situation, but the nonlinear situation itself, whether it is natural, the situation of communication with another person or with himself, is somehow resolved and, among other things, builds the subject himself" [95, p. 71]. A non-linear, creative attitude to the world, therefore, means the discovery of the opportunity to make oneself creative – "to allow a non-linear situation or another person to influence oneself" [5, p. 71].

In the context of the fractal-resonance approach, the "synergetics of education" is the basis for the formation of creative thinking: "immersion in synergetics "and the intention to use it as a" positive heuristic "is therefore associated with the development of game consciousness. A synergistically thinking person is homo ludens, a person who plays. In this case, synergetics acts as a kind of intellectual yoga, which has access to a fractal-holographic type of thinking. By giving recipes for mastering the complex, it destroys the "recipe" itself, the very previous method of recipe formation. It makes everything flexible, non-rigid, open, multi-valued. At the same time, the synergetic effect allows students to act gradually, based on their own forms of education, their own forces, potencies. Thus, the educational process based on the laws and principles of the fractal-resonance approach allows us to actualize the resource potential of students, to ensure their comprehensive harmonious development, which is accompanied by personal growth and syntonia. Taking into account the above characteristics of innovative educational technologies, we will present a description of those that can be used in the context of the laws of fractal pedagogy.

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