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Characteristics of Creativity as a Neuropsychological Manifestation of Personality in the Professional Activity of a Teacher

Iryna Maidaniuk

Doctor of Philosophical Sciences, Head of Department of Culturology, National University of Life and Environmental Sciences of Ukraine, Kyiv, Ukraine. mira-i@ukr.net
<https://orcid.org/0000-0001-8096-0244>

Olha Donchenko

PhD in Psychology, Associate Professor of the Department of Preschool Education, Berdyansk State Pedagogical University, Zaporizhzhia, Ukraine. olhadonchenko0@gmail.com
<https://orcid.org/0000-0002-0863-285X>

Roman Gurevych

Doctor of Pedagogical Sciences, Professor, Full Member (Academician) of the National Academy of Pedagogical Sciences of Ukraine, Director of the Educational and Scientific Institute of Pedagogy, Psychology, Training of Higher Qualifications of Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University, Vinnytsia, Ukraine. r.gurevych2018@gmail.com
<https://orcid.org/0000-0003-1304-3870>

Valentina Stets

Ph.D. (Philosophy), Associate Professor of the Psychology Department, Drohobych Ivan Franko State Pedagogical University, Drohobych, Ukraine. valentina_stec@ukr.net

Victoriia Naichuk

Doctoral Student of Psychology Department, Candidate of Psychological Sciences, H.S. Skovoroda Kharkiv National Pedagogical University, Ukraine. naichukvv@gmail.com
<https://orcid.org/0000-0003-2971-1386>

Liudmila Oliinyk

Ph.D. (Economics) Associate Professor of Department of Business and Right, Vinnytsia Social Economic Institute of the University of Ukraine, Vinnytsia, Ukraine. ol.lydmila@gmail.com
<https://orcid.org/0000-0003-1519-3354>

Abstract: *The article presents the analysis of creativity improvement as a determinant of the creative potential of a higher education institution teacher. Creative competence is one of the most important life resources that ensure the success of the professional activity of a modern teacher. The essence of the concept of creativity from the perspective of neuroscience is revealed, specifically of the neuropsychological approach. It is determined that creativity is an integrative formation, which includes a set of structural components that determine creative nature of human activity. Particular attention is paid to the importance of realisation of the creative potential of the teacher's personality, and the emphasis is put on the importance of lack of over-regulation of the environment in the educational organisation, observance of democratic relations among the teaching staff and a positive example to follow a creative personality in order to develop creativity. Pedagogical creativity is a certain mental and social readiness of the individual, which allows changing the situation so that the teacher and the student can interact effectively in joint activities. Pedagogical creativity presupposes that the teacher has a high level of competence in interpersonal perception, interpersonal communication, and interpersonal interaction. Development of creative competence and creative individuality of the teacher contribute to the increase of their professional competence and professionalism in general.*

Keywords: *educational process at higher education institution; creativity; improvement of soft skills; creative competence.*

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1. Introduction

The current socio-economic situation places high demands on the teacher of a higher education institution (HEI). Applicants for higher education at a modern HEI should master certain skills and abilities that allow them to meet the quality standards of teaching a particular discipline and the current level of knowledge. The quality of teaching, originality of the teacher, his/her ability to establish contact with the audience, wide erudition, and knowledge in allied sciences are highly valued. The purpose of a modern teacher is not only to transfer specific knowledge to their students but also to develop independent thinking skills, creativity, resources, and the formation of individual teaching styles in them, based on the totality of gained knowledge and experience. Professional training of higher education students, along with the formation of such qualities and skills as the possession of theoretical material and practical skills, the ability to maintain contact with the audience, openness, and friendliness, involves the development of their creativity.

In today's world, creativity is no longer an achievement of a certain group of people, but this is an element of a set of certain mental skills, necessary in any professional activity. These skills include: the ability to look at a problem from different points of view, to generate many ideas, to find possible solutions to a problem, and to improvise. Psychologists are constantly proposing new criteria for determining creativity. One of the factors in the formation of creativity is the neurophysiological features of each person. Thus, according to Carol Dweck (2013), there are:

- speed, which is the ability to quickly come up with a large number of ideas;
- flexibility, which is manifested in assessing the problem from all sides and finding patterns;
- originality – the ability to think “outside the box”;
- elaboration, which is manifested in the ability to detail and deepen ideas;
- resistance to closing off – constant search and absorption of new information.

During teaching, creativity as a manifestation of the neurophysiological process of personality development allows you to adapt to constantly changing conditions. Precisely because the teaching process is an activity in which people participate, it is unpredictable. Creativity is needed to deal with uncertainty, which is the rule rather than the exception in teaching practice. If teachers learn to improvise, adapt to the needs of students, use spontaneous activities, and make the most of opportunities, they get incredible results in their professional activities.

The requirements of society for the personality of the teacher and the results of his/her activities determined the need for radical changes both in the content of education and in the selection of pedagogical technologies for professional self-development. Such requirements and goals are realised during the creative approach in the educational environment – the system of continuous formation of creative thinking and development of creative abilities of the individual. Since the main goal of the education system is to “awaken” the creator in a person and develop the inherent creative potential.

A creative teacher allows each student at each educational level not only to develop the initial creative potential but also to form the need for further self-knowledge and creative development, to form an objective self-assessment (Onishchuk et al., 2020). In this case, the modern educational process should be aimed at mastering the emotional and value experience, ensuring the relative adaptability of the individual to the social and natural environment, as well as promoting self-realisation and fulfillment of the individual's spiritual potential.

The purpose of the research is to form the most effective ways of improving the creative abilities of a modern teacher of a higher education institution.

2. Characteristics of creativity as a neuropsychological manifestation of personality

For a long time, the concepts of creativity and art were identical, but this is not entirely true. These terms have many similarities but are also quite different in their meaning. The concept of a work of art refers to a process that has its specifics and leads to the creation of something new. By

the concept of creativity, we understand a person's potential and internal resources. In the modern world, the concept of creativity is associated with the "production" of new ideas that are relevant to a person and the products of his or her activities.

From the point of view of neuropsychological science, creativity is a personal quality that is based on the development of higher mental functions but is formed under the influence of the social environment, its value orientations, needs, the organisation of the information flow, and purposeful activity, primarily educational (Demchenko et al., 2021; Kosholap et al., 2021; Prots et al., 2021). Creative potential is inherent in the brain of every person. It is in this organ that the creativity of nature itself continues.

In the process of creativity, the merging of consciousness and subconsciousness into a new form of superconsciousness occurs, which integrates the most generalised mechanisms of the creative process. Creativity is a dynamic phenomenon. An alternative to divergent thinking as the basis of the creative process is creativity as the formation of associative connections when solving a creative task, which is ranked from the most common to the unique. Some psychologists put forward insight as the central mechanism of the creative process, that is, only what is obtained as a result of insight will be a creative solution. The intuition of selective decoding has been identified, which allows you to separate relevant information from irrelevant; the idea of selective combination, which allows you to correctly combine fragments of information; and the insight of selective comparison, which allows you to connect the information received with the already existing information.

All three of these types, as well as some specific ones, can manifest themselves in the creative process. An important role in creativity is given to the imagination, the successful work of which directly depends on the richness and diversity of a person's previous experience. The mechanism of imagination consists of the recombination of individual elements that are already in a person's memory and their integration into a new system.

In general, it should be noted that the neuropsychological foundations of creativity have been studied in sufficient detail, despite the existence of still debatable issues about the essence of this process (about what lies at the heart of creative thinking), about the features of a creative personality, about the criteria of a creative product, about the possibility of cultivating creative abilities and their connection with intelligence, imagination, and other mental functions. It is the presence of a sufficiently developed and extensive methodological and theoretical psychological base that allowed us to begin studying the brain support of the creative process.

An example of identifying the neuropsychological factor on a person's creativity is the emotional and psychological state of the person. Thus, the psychological state affects the motivation for creativity, the self-esteem of a person is reflected in the manifestations of creative expression of a person's imagination and consciousness. The emotional state is an important factor in finding a solution to a creative problem. Negative emotions often encourage intensive creative thinking, while positive emotions are a factor in the definition of creativity and creativity.

It can be assumed that the systematic study of the psychophysiology of creative activity began in the 1970s. All neurophysiological data on creative thinking can be divided into two large groups: the actual neurophysiological data obtained from healthy volunteers who performed tasks that included various components of creative thinking, and clinical data obtained as a result of the analysis of patients with various brain lesions and mental illnesses. The functions of the frontal lobes are to ensure the regulation of active states, the formation of a complex of needs and motives for activity, programming the latter and controlling its course, in the processes of self-awareness, as well as in the regulation of emotional states. Damage to the frontal lobes leads to a violation of complex motor acts, programming of actions, selectivity of various forms of mental activity, etc.

When considering a group of clinical data, the question immediately arises about the role of interhemispheric interaction in the creative process. There are two points of view on this problem: that both hemispheres are active and simultaneously contribute to the development of the process of

creative thinking, this is an independent, but parallel functioning of the hemispheres; that creativity is the result of the work of the right hemisphere, and it is either a permanent state of the brain, which leads to the formation of a special creative type of personality, or the result of "disabling" the left hemisphere, due to injury or illness and isolated activity of the right.

The researchers of the first group rely on the theory of interhemispheric interaction, which indicates the importance of the corpus callosum's functioning in the creative process. It transmits information from one hemisphere to another. After a commissurotomy operation (incision of the corpus callosum), the ability to be creative is lost.

The data of the second group, which postulate the dominance of the right hemisphere in the creative process, are based on the facts of increased creative activity when the left hemisphere is damaged. For example, a person with temporal lobe epilepsy demonstrated a high level of creativity; in a patient with dysfunction of the left frontal lobe, the effect of reducing creative activity during periods of repeated depression of the left hemisphere is described; a case of progressive dementia was recorded, which led to the loss of musical creativity.

The following stages are traced in its development:

- preparation (intuitive manifestation of a new idea);
- maturation (unconscious work on the idea);
- inspiration (the emergence of the idea of solving the problem);
- idea development;
- final design of the idea;
- test of the idea.

The creative process, according to Feldman, Csikszentmihalyi, & Gardner (1994), has three interrelated components:

- 1) reflectivity as the main process that distinguishes humans from animals and contributes to the formation of self-knowledge, self-esteem, planning, reflection, and analysis of the world;
- 2) purposefulness, which allows to organise the experience gained inside and outside the organism;
- 3) mastery of methods of transformation and reorganisation, which are provided by the culture of an individual and cause individual differences (Muscari, 1995).

From the standpoint of cognitive neuroscience, Dietrich (2004) has identified individual chains of the brain that are involved in certain higher functions of the brain. Until now, these findings have not been applied to research on creativity. It is assumed that there are four main types of creative ideas, each of which is mediated by a special neural circuit. By definition, creative ideas arise in the mind. Taking into consideration the idea that the working memory buffer of the prefrontal cortex holds the contents of consciousness, each of the four distinct neural loops ends there. When creativity is the result of intentional control rather than spontaneous generation, the prefrontal cortex also stimulates the creative process. Both modes of processing, intentional and spontaneous, can control neural computations in structures that promote emotional content and in structures that provide cognitive analysis, giving four main types of creativity.

Thus, creativity as a psychological phenomenon has close ties with social cognition, with the acceptance and evaluation of creative ideas by certain social groups.

3. Creativity in the professional activity of a teacher

Creativity develops in the process of assimilation of what has already been accumulated, and then there is a change, a transformation of the existing experience of the teacher. This is the path from adaptation to pedagogical innovation and its transformation, which is the essence and dynamics of the innovative activity of a modern teacher of a higher educational institution.

In the concept of Wallach and Kogan (1965), M. Wallach, one of the most authoritative researchers of creativity in the 1960s, proved that intellectual tests are weakly related to creative achievements and are not related at all in the case of high indicators. The combination of creativity and intelligence into a single factor in the case of average values M. Wallach and N. Kogan explained the use of similar test material (verbal, spatial, etc.) in tests for intelligence and creativity. Using a game form of creativity testing without a time limit for response and competition between the subjects, they obtained a correlation between scores on intellectual tests and creativity close to zero.

Among 11–12 year old students, four groups of children with different levels of intelligence and creativity were identified, differing in the ways of adapting to external conditions and solving problems: 1) children with a high level of intelligence and creativity have adequate self-esteem, high self-control, interest in everything new and independence of assessments; 2) children with a high level of intelligence and low creativity strive for school success, are secretive, have low self-esteem; 3) children with a low level of intelligence and high creativity are anxious, inattentive, have poor social adaptation; 4) children with low intelligence and creativity adapt well, have developed social intelligence, are passive, have adequate self-esteem. Therefore, we can conclude that the ratio of the level of creativity and intelligence of an individual is related to his personal qualities and ways of adapting to environmental conditions.

Pedagogical activity, as an integral part of the main program of professional education, provides a system-activity approach to the training of students and the development of professional competence of the teacher, forming a holistic view of the modern educational process.

In the process of pedagogical activity, one should get acquainted with the current state of educational work in general and special schools, possessing advanced pedagogical experience, forming the need for improving professional and pedagogical knowledge and skills, in the implementation of various functions of pedagogical activity, for example:

- deepening and consolidating theoretical knowledge and applying it in educational work;
- formation of the ability to organise students' cognitive activities, mastering the methodology of the educational process in primary grades;
- carrying out educational work taking into account the age and individual characteristics of schoolchildren and using creative abilities;
- independent planning, conducting, control, and adjustment of students' classroom and extracurricular activities;
- development of skills in independent pedagogical activity;
- mastering the ability to use modern pedagogical and innovative technologies in the educational process;
- working out the methods of mastering the team, forming the motivation of students;
- development of students' skills to identify, analyse, and overcome their own pedagogical difficulties;
- development of creative abilities and a creative approach to conducting the lesson;
- mastering certain skills of research work in the field of pedagogical sciences, observation, analysis, and generalisation of advanced pedagogical experience.

The specificity of pedagogical activity is that it has a complex nature, which requires the student to mobilise and apply all accumulated knowledge, abilities, and skills in the chosen specialty, general erudition, and creative abilities. The choice of this semester can also be because by this time the main educational disciplines in pedagogy and psychology have already been read, and the study of teaching methods of academic subjects continues.

Although the types of pedagogical activity almost coincide in their content, the nature of their implementation is different. The main goal of the teachers' pedagogical activity is the adaptation of students to the conditions of the institution, and the application of theoretical

knowledge in mastering the basics of all pedagogical functions in working with students of the same group.

The analysis of the results of many studies convincingly confirms that for the development of creativity, in addition to the internal potential of the teacher, the following factors are extremely important:

- 1) the absence of an excessively "regulated" environment in the educational organisation;
- 2) the presence of democratic relations in the teaching staff;
- 3) the presence of a positive example for imitation of a creative personality.

Since there are studies that show the low level of creativity of teachers in higher education institutions (Soriano de Alencar, 1996), it has been found that the majority of students rate their teachers as representing low levels of creativity. In addition, reliable correlations were found between various indicators of creative thinking and the level of creativity assessed by students. The results testify to the weak preparedness of teachers of higher education institutions to create a favorable environment for creativity.

There is also a problem that reflects a different vision of the concept of creativity from the position of the teacher and the position of the student. The team of authors indicates (Gaspar, & Mabic, 2015) that the evaluation of teachers' behaviour related to creativity during the educational process shows that there is a statistically significant difference in opinions between teachers and students. Apparently, teachers rate themselves better than their students. As a rule, students believe that teachers do not sufficiently encourage them to be active participants in the educational process.

It was determined that the use of media technologies reveals the possibilities of developing students' creative abilities with the help of new media technologies and innovative teaching methods in the conditions of higher professional education in the field of psychology and pedagogy (Koshanova et al., 2021). Creative thinking and creative problem-solving should become a necessary and important component of modern sustainable education (Mróz & Ocetkiewicz, 2021).

According to Zabelina (2018), creativity can be defined as the ability to create works that are at the same time new, meaningful, or useful, as opposed to trivial or strange. Creative people do not necessarily differ in their predominant mode of attention but can easily switch between different types of attention and therefore have flexible attention.

Therefore, creative teachers, even with objective difficulties, are constantly searching, experimenting, and finding reserves, first of all in themselves, in the methodology of their work, improving, modernising, and developing it, and at the same time, in such conditions, they achieve better results.

4. Characteristics of creative competence of the teacher of a higher education institution

There is a direct link between creativity, creative orientation, and creative activity. In this case, the work of a teacher can be considered through the prism of self-improvement and professional self-promotion. Also, creativity is determined by a creative source of creative personality development.

Creativity of the future teacher is considered by us as a professional-personality quality that integrates pedagogical and subject knowledge, motivation for new knowledge, and experience of creative mastering of educational practice, which determines the readiness of the future teacher for creative pedagogical activity, which forms the creative personality of a teacher.

An analysis of some studies showed (Chan & Yuen, 2014) that for the development of the teacher's creative potential, the following conditions related to personal factors are needed: (a) personality traits; (b) motivation; (c) attitude; and (d) a sense of purpose. In addition, there were two topics related to environmental factors: (a) schools and (b) community.

Let's mark the spheres of creative activity, where a teacher of HEI will be able to show themselves:

1. Methodological creativity - the ability to analyse pedagogical situations, choose professional behaviour samples, design the content and methods of pedagogical influence, study the advanced pedagogical experience and competently apply it in one's practice, taking into account individual characteristics of the teacher and students;

2. Communicative creativity (interaction with students in the course of pedagogical practice) is the choice of spheres of communication in professional activity and creative self-realisation, as well as the ability to adjust one's own activities;

3. Creative self-education is awareness of the significance of creative development for one's own professional activity, defining one's professional personality qualities that require further improvement and adjustment. Also, the development of a long-term program of self-improvement in the system of continuous self-education is vital.

It is believed that the creative self-development of the teacher is a supreme level of his/her professional formation. However, this does not exclude creative development at all stages of professional teacher training, but rather, on the contrary, earlier creative formation contributes to the best results in further professional activity. In addition, the association of the level of creativity as a professionally significant quality with the professional formation and development of the subjective position and professional self-consciousness of the teacher is important.

According to Ryndak (2001), the process of establishing a teacher's subjective position includes five stages:

- disadaptation (spontaneous behaviour, uncertainty of value-semantic targets);
- identification (reactive behaviour, subordination to authority);
- individualisation (search of the reference group, harmonisation of relations with the environment);
- socialiaation (role behaviour, valuable self-affirmation in the group);
- integration ("mature identity", relative "self-sufficiency" and rule-making).

The highest level of the teacher's subjective position correlates with the formed level of his/her creative readiness and creativity. Creativity as a professional meaningful quality of the teacher is directly related to his/her professional self-consciousness, as the awareness of his/her own professional role depends on how intense the manifestation of creativity by a teacher in pedagogical situations is.

It is important to note that emotional attitude and emotional involvement in a creative pedagogical process depend on stimulating emotions in the process of creative activity, which brings a student to a state of pleasant excitement, joy, inspiration, and absorption by creative activity.

We see that the primary goal of preparing a competent teacher, developing his/her professional competence is creative competence, as the teacher's creative competence provides effective research work, systematic improvement of the content and methods of teaching, accumulation of fruitful scientific and educational information, systematic study, analysis and evaluation of educational and cognitive activity, and behaviour of students.

Because creativity in most cases finds its practical implementation in a certain field of activity, then modern studies are characterised by recognition of the need to consider creativity in the context of pedagogical activity.

It should be noted that in the study of the problems of creative abilities in connection with the tasks of higher school the following properties inherent in the creative personality are singled out:

- interest in complicated and obscure things;
- inclination to ask questions;

- a sense of responsibility for the development of science;
- spontaneous curiosity;
- ability to deal with the solution of one and the same problem for a long time;
- high degree of scientific giftedness.

Analysing creative abilities, a high role of intuition in scientific creativity is noted, which is understood as the result of great mental work, which allows reducing the path of knowledge based on a rapid logical unconscious understanding of the situation and finding the right solution. In scientific creativity, intuition helps put forward hypotheses, the ability to see the problem, and its background, establish connections with other problems, formulate hypotheses, find criteria for measuring the investigated phenomena, describe and synthesise scientific facts, and find them a place in theory.

Creativity is one of the important skills of the twenty-first century and is central to higher education. However, if we consider a study of creativity in HEI, it is unclear how university lecturers conceptualise student creativity. From the point of view of the teacher, the work of students is classified into a hexagonal model in which teachers “see” the creativity of students, expressed through self-reflection of students, independent decisions, curiosity and motivation, making something new, multi-sighted and when students develop original new ideas. Thus, the central characteristic of pedagogical thinking is its creative character, which is determined by the specifics of pedagogical activity. The main mechanisms of pedagogical thinking are the analysis of the pedagogical situation; the professional identification mechanism; the mechanism of transition from a situational level of professional thinking to the super-situative and the mechanism of creative reflection (Jahnke, Haertel & Wildt, 2017).

We believe that the creative competence of the teacher includes a system of knowledge, skills, abilities, and personal qualities necessary for creativity. In the structure of the creative competence of an individual (including the teacher), the following qualities are traditionally emphasised:

- capacity for creativity, solving problem tasks;
- ingenuity;
- flexibility and critical mind, intuition, uniqueness, and self-confidence;
- the ability to set and solve non-standard tasks, ability to analyse, synthesise and combine, ability to transfer experience, prediction, etc.;
- emotional-figurative qualities: spirituality, emotional uplift in creative situations;
- associativity, imagination, feeling of novelty, sensitivity to contradictions, ability to empathy;
- insight, ability to see familiar in unfamiliar;
- overcoming stereotypes;
- tendency to risk and longing for freedom.

The development of creative competence of higher education teachers within the framework of the advanced training courses is contributed by the search for non-standard techniques for solving specific tasks and arguments to prove one’s point of view; development of critical thinking; creation of situations containing an internal collision and require the teachers to make creative decisions; use of active teaching methods, for example, the use of a problematic learning method; reflection of the teacher’s activity.

5. Ways to develop teacher’s creativity

For creativity development, the type of human thinking is important. Since with standard / fixed thinking, the abilities are considered as something static, and success depends directly on human intelligence. When thinking of growth, a person does not consider problems and failures as a sign of his/her underdevelopment but constantly improves, sets new goals, and acquires new skills.

In this context, creativity is not an ability endowed by nature, but a skill gained with effort. The main condition is that a person is motivated, has the correct ambition, and uses strategies.

The brain benefits from regular exercises that increase our concentration and creative potential. Just as the athletes, for instance, support their abilities with regular physical exercise. As an example, there are some paths/directions for the development of creativity of a modern teacher:

1. It is necessary to draw a task to be resolved. One can use mental maps or idea visualisation diagrams. Such information is much easier to structure, analyse, and find creative solutions.

The mental map is a diagram of visualisation of thoughts. To make it, one needs a piece of paper, a note board or a flipchart. It is necessary to draw a task and ideas that arose as a result of its solution on the diagram. With the help of a mental map, a member of the brainstorming team can quickly fix all ideas and structure them immediately. The information recorded this way is easier to analyse. In class mental maps help make a clear summary and more quickly memorise information.

2. It is necessary to segment a task to find the most effective solution options. Since, as a rule, a person is prone to inert thinking and follows a certain “template”, then such segmentation contributes to a non-typical analysis of possible combinations and gives an impulse to creativity.

3. It is necessary to formulate what prevents from solving the tasks and think about how to neutralise these difficulties. This path of “reverse brainstorming” is devoted not to the search for a solution to the problem, but to a certain “isolation” of a ready-made solution from negative factors. This approach allows us to see tasks from different sides.

4. Learn to combine the uncombinable and rearrange properties of unrelated objects. When combining uncombinable elements, we see tasks from a different angle. Formulate the task; select the properties of any subject that can help in solving the task.

5. Go beyond the existing circumstances and your own horizons. Formulate the task and think about how you would resolve it with all the necessary resources. Analyse each idea and evaluate its feasibility in current conditions.

6. Apply a random word method. Formulate the problem and say any word that crosses your mind. After that try to relate it to the problem. Repeat this method with different words.

Before becoming a creative teacher, it is necessary to analyse what the motives of this activity are. After choosing a goal, it is necessary to pay attention to the mood that precedes the creative process. It is quite important here that it is necessary to be able to muffle one’s own “internal criticism” (for example, to get rid of such thoughts as “this will not work”, or “the students will not like it”, etc.). This fact is particularly important to the development of creativity. Consequently, more attention should be paid to the right mood and be less critical of oneself. It is also necessary to work on one’s self-esteem and surround oneself with colleagues who share the same interests and goals and prompt a positive atmosphere.

6. Conclusions

The modern teacher of a higher education institution should make the process of teaching’s creativity a necessary part of daily life and not an accidental activity. The development of creative thinking is not a direct and smooth activity but requires patience, dedication, and commitment to excellence.

Any teacher can apply the method of mental maps to solve everyday working tasks. This method is so widespread through the ease and breadth of application, it is clear to almost every student that it does not require special knowledge and serious organisational training. The main thing is to adhere to the principles of brainstorming, strictly follow its steps, and form a team of generators and analysts.

The teacher’s creativity manifests itself in the search activity and is implemented in overcoming behavioural templates, in denial of monotony in contact with students, and in productive interaction with them.

In the process of creative activity of a teacher, creativity develops and pairs with the leading motifs, and at the same time, it is functionally fixed in the structure of the teacher's personality and manifests itself as the ability to create new pedagogical solutions, and thus identifying the creative style of his/her activities.

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