

R. I. Shvay*Lviv Polytechnic National University**e-mail: Roksolyanash@yahoo.com; ORCID: 0000-0003-3859-5196***STRATEGIES AND TACTICS OF TECHNICAL CREATION**

Modern education should be innovative. The stimulus of the activity of the innovative unit is the willingness to learn, the desire not only to receive ready knowledge, but the ability to think and analyze information independently. Creativity is a response to the growing complexity and dynamics of the social environment. The development of society requires a creative orientation, based on a creative approach to problem solving and decision making; search and implementation of changes, openness to changes, activity, self-management and life. The training of constructive creative thinking, strategy and tactics of creative activity through creativity training is based on the regularities of creative activity of professional employees (engineers, teachers, doctors etc.), takes into account the specificity of creative work, includes the main techniques of existing methods of stimulating creative activity and can be used on any stage of the creative process as an effective means of stimulating creative thinking.

Key words: education, creativity, innovation, creativity training, methods, tactics, pedagogical technologies.

Creativity is a human need because it helps adapt to changes in modern life. The development of society requires a creative orientation of the individual, a creative approach to problem solving and decision making, openness to change, activity, new behavior patterns, innovative behavior, creativity in all spheres of life. Most people avoid creative activity, engage in unproductive, stereotypical activities, do not realize their capabilities, although everyone (or almost everyone) has the potential to be successful in creative activities.

For the individual, it is important to develop not only to meet the needs, but in the creativity that makes work cease to be uninteresting, and implement the idea of equal life and social justice. It gives a sense of freedom and sense of life. Creativity is a guarantee of our quality of life, development of new technologies and growth of the economy. Activation of creative potential ensures the full social implementation of the individual, which in turn speeds up cultural and economic development in the country. The fast pace of life creates situations in which algorithms of actions and standard solutions are most often used. This is generally rational behavior from the point of view of the effectiveness of operations. However, modern education should be innovative. The implementation of educational innovations is the key to the competitiveness of project nations in the future. Young people must be able to anticipate changes and adapt to them on a personal and social level, have innovative thinking, so to achieve significant results in education, to survive in new conditions, teaching should be innovative and creative.

The psychological approach to the study of the process of creativity involves the study of its relationship with mental activity (intelligence, memory, thinking, perception, intuition, imagination, the role of the unconscious in creativity etc.). However, the reduction of creativity to the mental activity of a person does not allow to assess the diversity of this phenomenon. Contemporary psychology treats creativity as a phenomenon that manifests itself at various levels. Based on the Ya.O. Ponomariow concept of creativity, pedagogy of creativity should be considered as a fundamental science – the field of general pedagogy, which absorbs the results of psychology of creativity [7, c. 21]. S.O. Sysojewa defines the pedagogy of creativity as «the field of general pedagogy, which examines the peculiarities, regularities of training the creative unit, development and self-development of creative potential in the

learning process; creating psychological and pedagogical conditions to develop the creative potential of the individual in socially useful and individually significant areas of life» [10, c. 112]. The tasks in pedagogy of creativity include the development of psychological and pedagogical concepts of self-improvement and the involvement of personality in the creative process [10]. The main phenomenon studied in the pedagogy of creativity is training the creative personality of the student in his educational interaction with the teacher. The process of training a creative personality can not be separated from the creative development of the one who teaches and educates, because it aims not only to consciously assimilate knowledge, skills, mold the worldview, behavior culture etc., but also to create immanent motivation, characteristic traits, creative skills, mental processes that promote the success of creative activities. Creativity development systems, criteria for the selection of content, principles of psychodidactics, methods and tools are subordinated to the main goal – to develop creative abilities of young people. V.N. Drużynin emphasizes creativity among the general abilities – ‘creative is not the one who first created the ideas, and the one who made meaningful connections, worked on understanding the idea, its function in relation to other elements of the semantic space of knowledge that exist in this culture [2]. Ye.P. Ilyin defines creativity as a ‘subjective factor of creativity, systemic (multidimensional, multi-level) psychological creation. Creativity manifests itself in innovative transformations, in all (or some) areas of life (cognition, thinking, professional activities etc.) at the levels: unit (potential) – process – result [5]. Creativity is the foundation of a creative personality determinant of which the creative activity of the individual serves as an externally non-stimulated activity that relies on searching and processing (S.O. Sysojewa) [10]. According to Ye.P. Ilyin, the concept of ‘creativity’ is slightly wider than the concept of ‘creative potential’ because ‘creativity’ has potential and current forms. In the approach of W.O. Molako who uses the concept of ‘creative potential’, including skills, talents, talent and genius, that is, the whole spectrum of creative possibilities of a human being [8]. Yu.L. Trofimow [9] interpreted creativity as a process of creating a new, useful product. S.O. Gruzenberg, examining the mechanisms of the creative process, emphasizes the rational and mystical conception of creativity [1]. S.L. Rubinsztejn [9] applied the activity as an approach to

procedural understanding of creativity. He emphasized the importance of personality research not only as an active one, but also as a creative object of activity. The creative process is the result of the conscious activity of the subject, and the abilities are molded as a result of the psychic connection of the subject's activity with the objects of his activity. The abilities manifest themselves, and they mold and develop themselves in the process of their implementation in achievements.

The article analyzes the tactics and strategies of creative thinking.

The ground for developing abilities according to V.O. Molyako are anatomical and physiological innate tendencies, based on the process of various activities, trainings, and work – both general and specific abilities develop [8].

Each person has an individual set of abilities, therefore the presence or lack of stimulation for its development and implementation is decisive. The definition of abilities is characterized by special skills (management, practice), that is, the needs of modern society, outstanding achievements in all possible fields of activity (not only intellectual). Individual abilities develop through the interaction of three elements of the psyche: cognition, emotions and motivation. On their basis, intellectual and special abilities (in particular – creative) are trained, which may not be updated.

The definition of abilities applies to individual and psychological peculiarities, which are subjective conditions for the effective implementation of a certain type of activity and specific features (a combination of certain features, characteristics) that allow a certain level of creative activity to be achieved. It is a difficult task to distinguish between abilities and knowledge and skills that can significantly substitute abilities. Creative abilities are associated with intuition, holistic perception of information, as well as with emotions. The development of abilities is the result of a combination of basic components of abilities, which include: general and special abilities, motivational and personality factors, as well as the main environmental factors.

Immanent motivation is the most important for creativity, that is, the motivation that stimulates a person to act for themselves, instead of waiting for a certain reward, satisfying ambition or showing superiority over others. Outstanding creators are guided by immanent motivation, so the individual receives satisfaction from the process of acting. Such activity is treated as an end in itself. A special case of immanent motivation is the so-called autonomous cognitive motivation. Another important motivation for creativity is the need to improve (refine) reality. Students may be unmotivated, uninterested, passive, inclined to self-affirm, oppose, prioritize structured tasks, clearly defined form of control by the teacher or be motivated, focused on discussion and work, with the desire to be able to influence the content and learning process. Important motives of creativity are instrumental, gaming, professional, managerial, communicative and others. Questions motivating activity is always valid. Speaking of 'ideation, creativity and innovation as the value of modern society and a condition for training individuality, we in fact agree that the basis for social development is the development of human ability. This means, for example, the respect of the individual finally depends on whether at the right time a

man develops his own fortunes, discovers his abilities and after all achieves the level of abilities, talent etc. [11].

In the psychological and pedagogical literature more and more often new concepts related to creativity and abilities appear. For example, it concerns emotional intelligence and intuition. Emotional intelligence is a system of traits that combine abilities, motivation and perseverance in the process of achieving a goal, the ability to master impulsivity, mood regulation, understanding the mood of other people, an optimistic view of the future. Such a set of attributes has a greater impact on our lives than the intellect. The basis of emotional intelligence is self-awareness – understanding emotional states. People who recognize their own emotional states and other people cope better in life. Mastering one's emotions, emotional self-control is the basis of all achievements. Establishing interpersonal contacts is the ability to manage the emotions of other people. We emphasize that there is a correlation between intelligence and emotions, but very poor. Intuitive thinking is mostly demonstrative and subconscious. People who have intuition immediately understand the problem, although they can not prove it yet.

There is no close relationship between the two aspects of creativity, namely the concept of 'creativity' as a procedural result, embodied in creative works and 'creativity' as a set of general and specific creative abilities. On the other hand, scientists distinguish such a concept as 'inspiration', which stimulates the process of creation. 'A person who is in a state of creative inspiration, has a strong influence on other people, can often convince them, induce them to their thoughts, ideas, to lead with them [9].

The relationship between the level of intelligence, knowledge and creativity is complicated. At first glance, it is obvious that storing a large amount of information in the memory helps to find different approaches to performing tasks. However, pedagogical experience shows that a large amount of knowledge sometimes leads to a stereotypical solution to the problem. That is why a high (or even too high) level of intelligence does not guarantee creative achievements. You can be an intellectual and not become a creator [2]. Creative abilities and intelligence become independent factors in the conditions of a high level of intelligence (IQ more 120). There are no creators with low intelligence, but there are intellectuals with a low level of creativity.

Study of the dependence of intelligence – the work of M.S. Yegorova proved that the level of intelligence in old age depends to a certain extent on creativity at a younger age, but not vice versa. Creativity and intelligence continue to affect each other, but the effect is delayed, and therefore to see it only in world-wide comparisons (for example, creativity in 6 years and intelligence in 7 years [4]. Such research results are an additional incentive to the development of creativity.

According to V.O. Molyako, creative work is complex in an intellectual area, and education in the conditions of creative activity to a certain extent guarantees success in less complicated conditions in the future, as well as constant focus on rationalizing your work, improving its quality and efficiency [6].

3. Methods of development of technical creativity

The V.O. Molyako's method CARUS is designed for structural and functional transformations as well as the use of the main strategies in technical creation (combinato-

rial activities, analogue search, reconstruction, universal strategies, resultant exchanges) and tactics (interpolation, duplication, reproduction, convergence, deformation) and integration of the basic part, autonomy, sequential subordination, shifting, differentiation) of constructive activity.

V.O. Molyako has identified five main technical strategies for creativity, namely [3]:

- 1 – searching for analogues (analogy strategy);
- 2 – combinatorial operations (combining strategy);
- 3 – reconstructive activities (reconstruction strategy);
- 4 – universal;
- 5 – random substitution.

1. The strategy of searching for analogues associated with the use of a known structure or its part and the function when creating a new device. Newly created item must contain something new or be used in new conditions. Creating a new construction can be associated with such analogs that exist in nature. Of course, artificially created constructions can be very different from their live analogs.

2. The strategy of combinatorial operation means using various mechanisms together and their functions to build a new construction. Combinatorics is associated with different permutations, decreasing and increasing in size, changing parts in an already existing structure.

3. The strategy of reconstruction is related to the rebuilding as an antagonistic one – it is a rebuilding or more strictly constructing the reverse. For example, the direction of rotation or type of transmission may change, the rectangular part may be replaced with a round one etc. It can be concluded that reconstruction is the most creative approach associated with the search for a truly new one, different from the one previously used. Of course, the scope of creativity will be different: only one detail can change in the device, but you can rebuild the entire structure.

4. Universal strategy is associated with a relatively equal use of analogy, combining and to some extent reconstruction. This is a variant, when the action is such that it is difficult to give an advantage to one of them.

5. The strategy of random substitutions. There are cases where it is generally difficult to determine the nature of an entity's actions when there is no dominant tendency, and the search is done as if blindly, without a plan, or at least neither the subject itself nor the external observer can establish such logical connections.

Each strategy can be implemented in the form of a synthesis or analysis.

The psychological characteristic of the CARUS system is education with the use of impeding conditions. Therefore, special methods are used:

1. *The time constraint method* takes into account the significant impact of the time factor on mental activity. Without a time limit, the entity finds several options for solving the task, thoroughly rethinking its activities, as well as the quality and structure of the objects sought. In the limited time the subject either limits the use of what he or she knows best (most often it is the use of a template variant), or decisions to a certain extent are deformed. Through the type of these deformations one can determine the general tendencies of human mental activity. People react differently to time constraints. In some cases, the limitations increase the activity and get even higher re-

sults or changes in behavior, decrease the results and not always achieve the result. Limited time causes inhibiting, shock, that induces doubt, panic and quick refusal to complete tasks.

2. *The method of sudden prohibition (MSP)* consists of prohibiting the use of certain mechanisms in some of its structures. This method is also quite effective, because it destroys stereotypes, eliminating the possibility of using well-known types of devices, nodes and parts. So certain styles of activity, related to specific techniques and specific mechanisms are quite naturally trained by constructors. The use of MSP will contribute to their ruin. Adaptation to the application of this method is related to the reappearance of these trends in activities that are habitual and usual. The use of MSP promotes the development of the ability to change their activities depending on the specific circumstances. 3. *A quick sketching method* is necessary to diagnose specific features of mental activity. It is possible to suggest a continuous 'drawing' of the reasoning process – presentation of all constructions. Thanks to this technique, it is possible to more accurately determine the transformation of images, to determine the concepts and visual images of the given structure. It accustoms to greater control of their activities, regulation through images of the process of creation.

4. *The method of new variants* consists of the necessity of different problem solving, searching for new variants of problem solving, which always leads to the increasing of the activity, creative search. This method can be scanned at any stage, and not only after finding a solution (in a sketch version). Then this method can become both a kind of sudden ban method.

5. *The method of lack of information* is used in the case of the need for a special activation of operations at the first stages of problem solving. In this case, problems are reported with a significant lack of initial data necessary to run the solution. Thus, there may be one or more functional and structural characteristics of the initial data (direction of motion, speed of rotation). An important modification of this technique is the use of various forms of presentation of the initial state. Particularly, you can offer tasks, initial conditions of which are presented graphically or only in text form. The method is particularly effective in studying the peculiarities of understanding while discovering available knowledge.

6. *The method of informative supersaturation* is based on the conscious inclusion of unnecessary information to the initial conditions of the task. A variation of this method is a tip administered orally and containing unnecessary data that diverts attention from useful information. The teacher decides how to apply the method: to propose the choice of the relevant information or not to say that there is an excessive amount of information.

7. *The absurd method* consists of a specially proposed task that can not be solved. A typical option for absurd tasks is to build an eternal engine. You can also promote problems that are relatively absurd (for example, suggest a device design that can be used for a different purpose than required at the beginning). It helps to fight with thinking templates and creatively approach problem solving.

8. *The method of situational drama*, depending on the specific pedagogical idea and process of solving the problem, introduces some changes in the process of solving. These changes are designed to impede the activity

and can be very diverse – from the teacher's question ('question-plus') to different requirements not provided to ordinary procedures. The sudden ban method is a variation of this method. Each of these methods can be combined with others and have various modifications.

V.O. Molyako's research has shown that training of creative strategies becomes an important indicator of a person's mental education [6].

Conclusions

The creative activity of people, their specific actions, which characterize the specificity of thinking, only partially depend on the conditions and for the majority reflect the personal settings, the subject's strategies and their style of creative activity. The training of constructive creative thinking, strategy and tactics of creative activity through creativity training is based on the regularities of creative activity of professional employees (engineers, teachers, doctors etc), takes into account the specificity of creative work, includes the main techniques of existing methods of stimulating creative activity and can be used on any stage of the creative process as an effective means of stimulating creative thinking. That is why the basic forms of creative education are the following: systematic solving various creative problems through a special training of creativity, maximum anesthetization of all forms of life activities, from habits of accuracy to achieving world culture, participation in creative circles. The strategy for the development of science and education in contemporary conditions includes: creating alternative existing planning centers and hierarchical systematization of priority research; creation of regional professional scientific sub-centers with problem solving in particular sciences, preparation of personnel, performing special (including psychological) research on revealing the creative potential of man, upbringing, psychological rehabilitation, optimal use of science, technology, work culture and everyday life achievements; implementing programs for the development of science, education and culture, in particular through a wide network of creative groups with different profiles.

Modern education should be innovative. The stimulus of the activity of the innovative unit is the willingness to learn, the desire not only to receive ready knowledge, but the ability to think and analyze information independently. Creativity is a response to the growing complexity and dynamics of the social environment. The development of society requires a creative orientation, based on a creative approach to problem solving and decision making; search and implementation of changes, openness to changes, activity, self-management and life.

References:

1. Грузенберг С.О. Гений и творчество. Основы теории и психологии творчества. Москва: Красанд, 2010. 264 с.
2. Дружинин В.Н. Психология общих способностей. Санкт-Петербург: Питер, 2007. 368 с.
3. Здібності, творчість, обдарованість: теорія, методика, результати досліджень / за ред. В.О. Моляко, О.Л. Музики. Житомир: ПП. Рута, 2006. 320 с.
4. Егорова М.С. Сопоставление дивергентных и конвергентных способностей когнитивной сферы детей. *Вопросы психологии*. 2000. № 1. С. 36-46.
5. Ильин Е.П. Психология творчества, креативности, одаренности. Санкт-Петербург: Питер, 2011. 444 с.
6. Моляко В.О. Робоча концепція стратегічного та тактичного подолання кризових науково-освітніх проблем (психологічні ракурси). URL: http://www.lib.iitta.gov.ua/709430/1/Моляко_стаття.pdf (дата звернення 20.10.2018).
7. Педагогічна творчість: методологія, теорія, технології / за ред. С.О. Сисоевої, Н.В. Гузій. Київ: НПУ імені М.П. Драгоманова, 2005. 183 с.
8. Психологічне дослідження творчого потенціалу особистості : монографія / наук. кер. В.О. Моляко. Київ: Педагогічна думка, 2008. 208 с.
9. Психологія / за ред. Ю.Л. Трофімова. Київ: Либідь, 2001. 560 с.
10. Сисоева С.О. Основы педагогической творчости. Київ: Міленіум, 2006. 344 с.
11. Феномен інновацій: освіта, суспільство, культура : монографія / наук. ред. В.Г. Кремень. Київ: Педагогічна думка, 2008. 472 с.

Роксолана Швай

Національний університет «Львівська політехніка»
СТРАТЕГІЇ І ТАКТИКИ ТЕХНІЧНОЇ ТВОРЧОСТІ

Сучасна освіта має бути інноваційною. Стимулом діяльності інноваційної особистості є бажання вчитися, бажання не тільки отримувати готові знання, а й здатність самостійно мислити та аналізувати інформацію. Творчість є відповіддю на зростаючу складність і динаміку соціального середовища. Розвиток суспільства вимагає творчої орієнтації, що полягає у творчому підході до вирішення проблем і прийняття рішень, пошуку і впровадженню змін, відкритості до змін, гнучкості у діяльності, управління собою та своїм життям. Навчання конструктивного творчого мислення, стратегії та тактики творчої діяльності на тренінгах творчості базується на закономірностях творчої діяльності професійних працівників (інженерів, викладачів, лікарів тощо), враховує специфіку творчої діяльності, охоплює основні прийоми існуючих методів стимулювання творчої діяльності і можуть бути використані на будь-якому етапі творчого процесу як ефективний засіб стимулювання творчого мислення.

Ключові слова: освіта, творчість, інновація, навчання творчості, методи, тактика, педагогічні технології.

Отримано: 26.10.2021