

Psychological Mechanisms Of Development Students' Creative Thinking

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Abstract. Thinking issues, students' creative activity, stages of creative thinking, independent thinking features, development of thinking in the educational process, characterize creative thinking, considers the types and styles of thinking, analyzes the psychological mechanisms of the development of creative thinking, describes specific and abstract tasks, projects and tasks for self-study of students are discussed in this the article.

Index terms: creative thinking, critical thinking, divergent thinking, insight, depth of thinking, erudition, originality, empathic thinking, anticipation, creativity, objective thinking, figurative thinking, sign thinking, symbolic thinking.

INTRODUCTION

Training of a sane, talented and creative person, as well as its preparation for the development of society is a priority task of the education system of each country in the global education system. According to UNESCO, it is in a higher educational institution that the opportunities for achieving the sustainable development of vital knowledge, skills and abilities are realized. Currently, in the most developed countries of the world, the need for higher education is growing rapidly. Statistics show that while in undeveloped countries, 8% of young people study at universities, in the most developed countries this figure is 74%. Mastering higher education is one of the most important needs of mankind on a global scale, therefore, with its satisfaction, the problem of enriching the content of the educational process, improving the activities of teachers, developing intellectual abilities, and students' thinking is actualized. The World Education Index is a combined indicator of the United Nations Development Program (UNDP). One of the key indicators of social development. Based on these considerations, on October 8, 2019, the President of Uzbekistan Shavkat Mirziyoyev signed a decree approving the Concept for the Development of the Higher Education System until 2030. In framework of the concept, more than 70 targets have been approved which are planned to be achieved by 2030. They are an increase in the coverage of graduates with higher education from the current 20% to 50%, the number of non-state universities, including through public-private partnerships (PPPs), from 5 to 35, and the coverage of the credit-modular system from 2% to 85% among them. The concept provides for the transition to the concept of "University 3.0", in the framework of which a wide scientific research work will be carried out in universities, technoparks, laboratories, incubators and even museums will be created. World scientific research on the psychology of thinking has reflected the formation of

theoretical and practical, innovative, creative, compositional, critical, technical thinking, the impact of educational resources and information technologies on the development of visual thinking, the culture of thinking and its development through the study of foreign languages. Of particular scientific interest are the psychological mechanisms for the development of creative thinking, the conditions and prerequisites for their implementation. The relevance and significance of the problem of the development of creative thinking is due to the current demand for such qualities as originality, flexibility, speed, accuracy, as well as the high potential of the technology of problem-based education, training in cooperation and design and research activities in the context of the development of thinking among students. During the period of independence in our country, special attention is paid to the realization of the intellectual potential of youth. In particular, the Strategy for Action on Five Priority Directions of the Development of the Republic of Uzbekistan in 2017–2021 defines the tasks of "Educating young people with strong life views, physically healthy, spiritually and intellectually independent, devoted to their homeland, increasing their social activity in the process of deepening democratic reform and development of civil society". Currently, the most important measures that are being implemented: carrying out research work to enhance the educational activities of students, improving the psychological mechanisms of development of thinking that provide independent and creative approaches to learning, and assimilating knowledge and skills that are in demand in professional activities. In world psychology, there are many studies related to the study of thinking as an important branch of a kind of intellectual human activity. Foreign researchers-psychologists studied the methodological issues of thinking (O. K. Tikhomirov, S. L. Rubinshtein, L. L. Gurova, L. S. Vygotsky, Ya. A. Ponomarev), the relationship of thinking with cognitive factors (L. M. Vekker, M. S. Egorova, N. V. Kalacheva, S. N. Orlova), the relationship of thinking, intelligence and intellectual abilities (D.V. Ushakov, M.A. Kholodnaya), thinking and its types, creativity and psycho-diagnostics of creative activity (Zh.A. Balakshina, V.N. Druzhinin); creative thinking, its features and development methods (E.I. Boyko); the organizational aspects of the educational process for cognitive activity (M.V. Gulakova, T. V. Kornilova). Despite the variety of scientific approaches to the consideration of thinking as a subject of psychological research, the problem of

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psychological features and mechanisms due to its weak development determines the appropriateness of systematic research. The issues of thinking, creative activity, features of independent thinking, the development of thinking in the educational process were considered by Uzbek scientists-psychologists (V.M. Karimova, R.I.Sunnatova, N.S.Safaev, Z.T. Nishonova, K.K. Mametov), however, studies on the problem of psychological mechanisms of students' thinking were not implemented in the practice of teaching at a university.

METHOD

Studying the psychological mechanisms of the development of students' thinking, we conducted a stating experiment. In the process of the ascertaining experiment, the methods "Determining types of thinking and the level of creativity" by J. Bruner and "Styles of thinking" by A. A. Alekseev and L. A. Gromova were used. Types of thinking and the level of creativity of students are studied in accordance with the stages of training. In addition, when revealing a meaningful relationship between the types of students' thinking, a correlation analysis was carried out. The prevailing type of thinking according to the general average results of students and the peculiarities of the scales of the methodology is "Sign Thinking" (9.23). Students in mutual consonance can manifest the types of "imaginative thinking" (7.70), "subjective thinking" (6.99) and "creativity" (6.90), "symbolic thinking" (5.67) was also established. These indicators indicate that students in the learning process and in life issues solve problems and get out of situations, relying on various types of thinking. This fact does not give a complete answer to the question of what type of thinking prevails among them. Therefore, we attempted a correlation analysis of the relationship between students to manifest their types of thinking. Table 1 shows the correlation analysis between the indicators.

Results and discussion

Table 1
Correlation between the types of students' thinking and creativity (n = 450)

Scales	Subject thinking	Symbolic thinking	Sign thinking	Creative thinking	Creativity
Subject thinking	1	0,193*	-0,040	-0,044	0,200*
Symbolic thinking		1	0,236**	-0,087	0,025
Sign thinking			1	-0,031	-0,198*
Creative thinking				1	-0,057
Creativity					1

Note: * $p \leq 0,05$, ** $p \leq 0,01$

Judging by empirical indicators of the correlation analysis of the relationship between the types of students' thinking, the growth of "objective thinking" contributes to the growth of "symbolic thinking" ($r = 0.193$, $p \leq 0.05$). The results obtained indicate that when finding solutions to problems, students take actions related to subjects, and when creating a new one they rely on ideas. The development of "objective thinking" of students is an indicator of the growth of

creativity among students ($r = 0.200$, $p \leq 0.05$). That is, the conscious work of students on thought, information leads to the development of creativity, creative ability, the emergence of new fundamental ideas. In addition, the high level of "symbolic thinking" of students ensures the growth of "sign thinking" ($r = 0.236$, $p \leq 0.01$), which indicates that students, when assimilating information, act based on work on arithmetic operations and search training, fluent, ordinal, sequential, systemic and exact characters. In the process of research between the "sign thinking" and the "creativity" of students, an inverse correlation relationship was revealed ($r = -0.198$, $p \leq 0.05$). According to the methodology, the priority of "sign thinking" is more characteristic for humanitarian students. This pattern is somewhat different for students studying natural and exact sciences. Along with the study of the types of students' thinking, we considered thinking styles. Based on the peculiarities of thinking styles, an approach was chosen that allows changing the thinking style when it becomes necessary to solve specific and abstract tasks, projects, independent work tasks, collective and individual tasks. Given this fact, the study paid attention to the study of the relationship between students' thinking styles (Table 2).

Table 2
Correlation indicators between students' thinking styles (n = 450)

Scales	Synthetic style	Idealistic style	Pragmatic style	Analytical style	Realistic style
Synthetic style	1	-0,207*	0,097	0,109	-0,055
Idealistic style		1	-0,019	0,066	-0,037
Pragmatic style			1	0,199*	0,014
Analytical style				1	-0,126
Realistic style					1

Note * $p \leq 0,05$

We have identified two coefficients that reflect the positive and negative correlation between the students' thinking styles. A negative connection was found between the "synthetic thinking style" and the "idealistic thinking style" ($r = -0.207$, $p \leq 0.05$). Although these students have the ability to create something new in the educational process, to perform original works, the ability to generalize opposing ideas and information, at the same time they are unable to analyze the problem thoroughly, holistically evaluate it in its entirety. In addition, a positive correlation was found between the "pragmatic" and "analytical thinking styles" ($r = 0.199$, $p \leq 0.05$) of students. It turned out that this leads to students making decisions based on their own experience, using convenient and simplified material, comprehensive and systematic consideration of problems, along with a predominant desire to get results faster, increasing attention to details, the desire to collect objective facts, information on the problem before decision making. By studying the interconnections between the types and styles of students' thinking, clarity was introduced into their interconnection (Table 3).

Table 3
Correlation indicators between styles and types of students' thinking (n = 450)

Scales	Subject thinking	Symbolic thinking	Sign thinking	Creative thinking	Creativity
Synthetic style	0,049	0,018	0,263**	-0,001	0,165*
Idealistic style	0,038	-0,019	-0,140	0,061	0,025
Pragmatic style	0,157	0,072	0,092	0,258**	0,078
Analytical style	0,108	0,068	0,038	0,071	0,056
Realistic style	-0,171*	0,134	0,177*	-0,111	-0,091

Note: * $p \leq 0,05$, ** $p \leq 0,01$

The patterns of internal communication between types and styles of students' thinking have a number of significant coefficients. The prevalence of "sign thinking" among students contributes to the growth of "synthetic thinking" ($r = 0.263$, $p \leq 0.01$). This circumstance characterizes the fact that, with a predominance of a "sign style of thinking," students of the humanitarian mindset are always inclined to work with objects and concepts with specific content, and they learn information on the basis of their conclusions. This leads to the development of students' abilities to create new ones, to carry out original works, to link ideas, to combine dissimilar, sometimes even contradictory opinions. The growth of students' creativity can contribute to the development of the "synthetic method of thinking" ($r = 0.165$, $p \leq 0.05$). This manifestation of the result is fully consistent with the properties of the implemented methods. The prevalence of "imaginative thinking" among students contributes to the development of "pragmatic thinking" ($r = 0.258$, $p \leq 0.01$). This means that there are students who do not have physical limitations in the process of assimilation of the material and in the process of performing actions are able to assimilate information rich in visual materials. As a result, the student will try to make decisions based on his own experience, easily and quickly learn material, and apply effective ways to obtain results in working with information.

RESULTS

In order to build the ability to apply the knowledge, skills and abilities learned in the educational process in various life situations, we tried to take advantage of tasks that contribute to the growth of creative thinking at the next stage of the study. To do this, after the implementation of tasks in the exercises of Edward de Bono "Development of thinking" aimed at finding solutions to problem situations, we took advantage of tasks to develop creativity. After completing these tasks, we turned to the diagnosis of students' creative thinking. Already the early results of our experience have shown that specific directions and creative tasks stimulate the development of students' thinking. This circumstance is observed in the results of the implementation of the Creative Thinking test. In the results of the test tasks for the series, you can see that there is a sharp difference between the results of the first and second

tests. The results of the second test after completing almost all tasks had significant statistical differences compared with the first. The main reason for this is the positive impact of courses on the development of thinking and guidance on solving creative tasks even before performing tests (Table 4). The results of test tasks indicate that for the development of creative thinking, it is necessary to introduce during training sessions tasks that require search, accurate and operational thinking, and original reasoning.

Table 4
Students' results on the subtests of the battery of tests "Creative thinking" (n = 84)

Subtest	Tasks Form	Test stage	X	σ	t
1 st subtest	Use of subjects	First test	37,62	5,12	-9,577***
		Second test	46,52	4,64	
2 nd subtest	Conclusions	First test	35,50	5,21	-11,071**
		Second test	42,44	4,73	
3 rd subtest	Expression	First test	37,62	5,12	10,752**
		Second test	45,94	3,12	
4 th subtest	Verbal association	First test	35,00	5,24	-9,574***
		Second test	39,48	4,49	
5 th subtest	Composing Images	First test	32,26	6,07	-7,939***
		Second test	37,84	4,62	
6 th subtest	Sketches	First test	33,90	5,45	-5,119***
		Second test	37,08	4,32	
7 th subtest	Hidden form	First test	34,84	5,31	-6,889***
		Second test	39,06	4,47	

Note: *** $p \leq 0,001$

During the experiment, the state of development of students' thinking was analyzed based on the characteristics of the organization of the educational process (Table 5). For this, emphasis was placed on four types of training sessions from a methodological perspective: a lecture, a seminar, practice (work in small groups), and design and research activities. Creative Thinking test showed high efficiency of its influence on the development of students' thinking both during classes and at the end of the academic semester when performing educational tasks on the basis of reports, seminars, work in small groups, during design and research activities. As a result, it was revealed that classes based on design and research activities, despite the organizational and methodological complexity, are the most effective. Indicators of creative students by organizational and methodological features of training sessions (practical lesson and project research) (n=56)

Subtests	Practical (work in small groups)						Design and research activities						t		
	Fluency		Flexibility		Originality		Fluency		Flexibility		Originality		t	e	o
	X	σ	X	σ	X	σ	X	σ	X	σ	X	σ			
Use of subject	11,70	1,26	13,86	3,28	10,50	3,79	12,20	1,62	14,06	3,27	11,16	3,62	-2,28*	-1,64	-2,11
Conclusions	10,13	2,12	16,50	4,15	8,06	2,57	9,20	1,66	15,60	3,97	8,50	2,33	2,39*	2,37	-0,57
Expression	9,53	1,92	16,03	3,58	9,50	4,01	9,96	1,56	16,10	3,48	8,50	3,25	-2,09*	-0,21	1,23
Verbal association	11,23	2,28	16,13	3,70	7,16	2,84	11,70	2,27	16,93	4,16	10,06	3,95	-1,45	-1,76	-3,17
Composing Images	11,13	1,94	18,96	4,21	9,63	2,52	11,53	2,40	20,60	3,90	9,33	3,40	-1,24	-3,00**	0,45
Sketches	11,20	1,12	21,50	3,11	7,00	2,49	13,53	2,71	22,20	3,57	11,00	4,02	5,14***	-1,52	-4,94***
Hidden form	11,17	1,01	21,35	3,10	7,50	2,54	13,80	2,59	23,00	2,97	10,46	3,52	5,04***	-2,80*	4,04***

Note: ** $p \leq 0,01$; * $p \leq 0,05$

It was found that in the "Use of subjects" subtest, the organization of design and research activities gives better results compared to the speed of thinking in completing tasks in small groups (11.70 and 12.20 points, $t = -2.85$, $p \leq 0, 05$). According to the "Conclusions" subtest, when performing tasks in small groups, the speed of thinking prevails compared to design and research activities (10.13 and 9.20 points, $t = -2.39$, $p \leq 0.05$). Belongs to the "Expression" subtest, the indicators of the speed of students' tasks in design and research activities are higher compared to the speed of tasks in small groups (9.53 and 9.96 points, $t = -2.09$, $p \leq 0.05$). It follows that the development of students' thinking and the criteria for speed and flexibility that determine it can be formed in both classes. According to the subtest "Compilation of images", a sign of flexibility is important in ensuring the speed of thinking, and it is advisable to organize classes according to the design and research style (18.96 and 20.60 points, $t = -3.00$, $p \leq 0.001$). Since haste, self-doubt, inability to generalize, focusing on specific criteria in design and research activities cannot give positive results. Conducting classes on the "Sketches" subtests (11.20 and 13.53 points, $t = -5.14$, $p \leq 0.001$), (7.00 and 11.00 points, $t = -4.94$, $p \leq 0.001$) and "Latent forms" based on design and research activities (11.17 and 13.80 points, $t = -5.04$, $p \leq 0.001$; 21.35 and 23.00 points, $t = -2.80$, $p \leq 0.05$; 7.50 and 10.46 points, $t = 4.04$, $p \leq 0.001$) showed high efficiency compared to the organization of practical classes in small groups. The results obtained show that the organization of classes on the basis of design and research activities helps to accelerate mental operations, ensure flexibility and originality of thinking. Based on the scientific results obtained from all stages of the study and their analytical indicators, we determined the structure of psychological mechanisms for the development of students' thinking (Figure 1).

The presence of three substructures that determine the structure of psychological mechanisms for the development of students' thinking is revealed:

- ✓ Tasks used in the educational process;
- ✓ Motivational, specific, methodological and typed components of the development of thinking;
- ✓ Principles and prerequisites for the development of thinking.

Based on the features and levels that make up the elements of these substructures in the educational process,

it is possible to assess the state of development of thinking (creative) students.

There are a number of features characterize the development of creative thinking of students:

- ✓ The presence of a high degree of motivation when working on mental tasks;
- ✓ Willingness to use a new productive method;
- ✓ Reliance on intuition, and not on simple logical conclusions;
- ✓ Ability to pose a problem and an independent approach to its solution;
- ✓ Obtaining new results and new products as an important aspect of creative thinking.

The factors affecting the development of creative thinking in the educational process include subjective, personal, situational and conditional factors. The reasons for situational factors are lack of time, stress and anxiety, high and low degree of motivation; personality factors - insecurity (low self-esteem) or overconfidence, haste, prevalence of asthenic conditions (feelings and emotions), risk aversion, the dominance of motivation to avoid failure over the motivation for success. The substructures of thinking that we cited and their constituent elements undoubtedly contribute to drawing attention to the problem of the development of thinking and the achievement of predicted results. As a result, special studies, we have confirmed that understanding is a structural part of thinking and cannot exist in isolation. In the process of quantitative analysis revealed three stages and three types of understanding of theoretical judgments. Along with this, the priority importance of types and types of understanding, their gradual improvement in the classroom was discovered. It is also revealed that the thinking of students is a cognitive process consisting of diverse and complex structures. In revealing the essence of students' thinking, it is impossible to do without styles and types. Students make judgments in the process of working on subjects, in the assimilation of information in the educational process, and in the knowledge of the world rely on symbols, images when assessing ways to solve problems, apply exact formulas and mathematical calculations, study events and phenomena, based on the principles of generalization, apply a creative approach. It is proved that students in the learning process as a subject of thinking are capable of creating something new, implementing original works, the interconnection of ideas and dissimilar things, sometimes

even conflicting opinions and information, easy perception of new ideas, decision making based on personal experience, comprehensive and systematic review of problems, assessing what student saw or heard as reliable facts. The development of students' creative thinking is ensured only through ordered, interconnected and always influencing each other means and premises. This is an important process, organized regardless of the stage of educational activity, the direction of education and the type of activity. In the development of creative thinking, the key factor is the orientation of tasks from simple to complex, the orientation of situations to find operational, accurate, thorough and original solutions. In the process of forming students' creative thinking, along with orientation to questions related to the educational process, their enrichment with life questions was stimulated, stimulating the development of thinking and non-standard understanding of standard judgments. Problematic and challenging creative thinking tasks create activity among students; create conditions for the development of willpower, which contributes to the formation of a positive, creative and active research position. A problematic situation shapes thinking. This thesis once again found confirmation in our study. The statement of multi-series problem tasks forms a peculiar attitude of students towards understanding the content of tasks, assessing its nature and finding solutions. Problem assignments form students' skills for quick, accurate, concise, thorough and original thinking. Along with this, in the experiment it was proved that the problem situation is an important factor in the realization of the personality potential. The organization of the creative thinking process of students requires taking into account the direction of each subject, the course of study and the individual characteristics of students, and the tasks to be developed should have such characteristics as efficiency and economy, simplicity and convenience, and dedication to individual and collective work. The content of teaching creative thinking (tasks, the technology of working on them, discussing predicted results and mastering the diagnostic system that evaluates them) is an important condition for revealing the true nature of the problem. In the development of creative thinking of students, a special place is occupied by lectures, seminars, practical and design and research activities. The organization of training based on design and research activities, effectively affects the speed, forms the flexibility and originality of students' thinking.

CONCLUSIONS

1. As a result of special studies, we have confirmed that understanding is a structural part of thinking and cannot exist in isolation. In the process of quantitative analysis revealed three stages and three types of understanding of theoretical judgments. Along with this, the priority importance of types and types of understanding was discovered, their gradual improvement in the classroom.
2. The study revealed that the thinking of students is a cognitive process, consisting of diverse and complex structures. In revealing the essence of students' thinking, it is impossible to do without styles and types. Students make judgments in the process of working on

subjects, in the assimilation of information in the educational process, and in the knowledge of the world rely on symbols, images; when assessing ways to solve problems, apply exact formulas and mathematical calculations, study events and phenomena, based on the principles of generalization, apply a creative approach.

3. It is proved that students in the learning process as a subject of thinking are capable of creating something new, implementing original works; the interconnection of ideas and dissimilar things, sometimes even conflicting opinions and information; easy perception of new ideas, decision making based on personal experience; comprehensive and systematic review of problems; assessing what student saw or heard as reliable facts.
4. The development of students' creative thinking is ensured only through orderly, interconnected and always influencing each other means and premises. This is an important process, organized regardless of the stage of educational activity, the direction of education and the type of activity. In the development of creative thinking, the key factor is the orientation of tasks from simple to complex, the orientation of situations to find operational, accurate, thorough and original solutions.
5. In the process of forming students' creative thinking, along with focusing on issues related to the educational process, their enrichment with life questions was stimulated, stimulating the development of thinking, and non-standard understanding of standard judgments. Problematic and challenging creative thinking tasks create activity among students; create conditions for the development of willpower, which contributes to the formation of a positive, creative and active research position.
6. A problematic situation shapes thinking. This thesis once again found confirmation in our study. The statement of multi-series problem tasks forms a peculiar attitude of students towards understanding the content of tasks, assessing its nature and finding solutions. Problem assignments form students' skills for quick, accurate, concise, thorough and original thinking. Along with this, in the experiment it was proved that the problem situation is an important factor in the realization of the personality potential.
7. The organization of the creative thinking process of students requires taking into account the direction of each subject, the course of study and the individual characteristics of students, and the tasks to be developed should have such characteristics as efficiency and economy, simplicity and convenience, intended for individual and collective work. The content of teaching creative thinking (tasks, the technology of working on them, discussing predicted results and mastering the diagnostic system that evaluates them) is an important condition for revealing the true nature of the problem.
8. In the development of creative thinking of students, a special place is occupied by lectures, seminars, practical, and design and research activities. The organization of training based on design and research

activities, effectively affects the speed, forms the flexibility and originality of students' thinking.

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