Psychology of creation

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Two paradigms-two vectors of creating the new

At the current stage the history of researching creativity appears to have drawn a curve which agrees with the methodological conceptions of L.S.Vigotsky. We stress that the current investigation of creativity takes place within two paradigms.

1. Testological paradigm, in which Guilford's definition of the creativity index "Cr", different from the index of intelligence "IQ", illustrates a tendency typical especially for the componentwise. In this paradigm the vector of development points toward breadth. Based on distant associations, divergent thinking does not have the same content as divergence as a mechanism of evolution. Therefore divergent thinking does not guarantee gaining of new knowledge, but only provides some possibility for it.

2. The paradigm "process-activity" in which we single out the true phenomenon based on an identification of the unit of creativity analysis. This paradigm is a result of development of the cognition process inward, of "exploding the layers of existence" [Rubinshtane S.L.].

Key words: *Creativity, divergent thinking, originality, "creativity field", validity, creativity index, index of intelligence, independent abilities.*

At the current stage the history of researching creativity appears to have drawn a curve which agrees with the methodological conceptions of L.S.Vigotsky. His idea, that of a psychology which intends to study phenomena in their complexity, should replace the methods of dividing into elementary components (atoms) by methods which single out essential non-elemental units, and should make obvious the logic of understanding creative abilities, as it historically developed in the 19^{th} and 20^{th} centuries.

Generalizing, we can single out two most common approaches in understanding creativity. The first one considers creative ability as the maximal level in the development of abilities. This approach was dominating during the first century of growth of the young science of psychology, and was supported by the mechanistic tradition which recognizes just quantitative differences. However, eventually it was proven that the creative output of a person does not necessarily correlate with the level of his or her intellectual abilities. Therefore this existing approach could not fulfil the social mandate for identification of people with a high creative potential which arouse at the beginning of the post-industrial phase in the development of society. This method was exhausted and this was perceived as a crisis in the study of the problem. Nevertheless, the occurrence of the crisis was logical for "by equating the whole with its elements,

the problem is not solved, but instead evaded" [4, p. 12]. That's why in the fifties a desire emerged to single out a certain specific ability for creativity beyond intellect. This tendency found a consistent implementation in the methodological approach of J. Guilford. In addition, understanding the nature of creativity switched from a direct identification with the intellect to a direct contraposition of creativity to intellect. According to this new approach, the factors of creativity exist independently and parallel with other intelligence factors having their own localization (factors of divergent thinking). Guilford's definition of the creativity index "Cr", different from the index of intelligence "IQ", illustrates a tendency typical especially for the componentwise analysis and consisting in "swaying form outright equation to a similarly metaphysical and absolute breach and detachment" [4, p.12] Then a "purely external mechanical connection between them (Cr versus IQ – D. B.) as between two different processes" is being sought [4 p.12]. Guilford's true goal was a more complete construction of a multifactorial structure of intellect that would not be reduced to the factors which represent learning activity, and which according to his opinion are being assessed by IQ tests. In particular creativity factors would appear here. After considering all the known factors, including the abilities of fluency, flexibility, originality and sensitivity to problems, that find their logical places inside of this system, Guilford came up with a system (model) of these factors called "the structure of intellect." [11 p. 153] Hereby, creativity factors are included into a unified structure of intellect, becoming one of its parts. However, being only a part of the structure, they do not influence the general nature of intellect. The set of all factors can not be interpreted as a set of all components of this structure, which thereby exhibits non-additive properties, that is properties extrinsic to the components. In Guilford's structure all factors are independent abilities. This creates the possibility to objectively consider the factors, and their corresponding indices, assessed in the "intelligence" tests and special "creativity" tests and of their indices as separate ratings. This is demonstrated by numerous comparative studies of creativity and intelligence in the second half of the 20th century. These studies are carried out in a triad determined by the incorporation of educability as a factor of vital validity of intelligence and creativity tests. These three factors have formed the foundation of aptitude classification as independent criteria for the three separate kinds of aptitude: academic, intellectual, and creative.

In this way fluency, flexibility, and sensitivity to problems are considered to be creativity factors. How are these factors defined? Sensitivity to problems was the first ability singled out by J.Guilford. This factor is defined by the score of tests assessing the ability to see defects, needs, and deficiencies. The factors of fluency and flexibility provide the necessary motion momentum which assures the inevitable turnover of "trial and error" within this paradigm. As a criterion for his empiric study Guilford used originality -"one of the most important aspects of creative thinking" [9, p. 362; 13]. However he could not use the true definition of originality as the creation of a novel product. While one should judge the output of a scientist precisely according to this latter criterion, this is not possible within

the approach of testing, for the feature should be represented continually. In the attempts to measure originality, tests for verification of the approaches to measurement were designed: unusual answers, measured by the weight of the individuals' answers compared to their statistical infrequency in the group as a whole; remote, unusual, unconventional associations in specially prepared association tests; and cleverness of the answers [3]. There is a widely known example of semantic originality that Guilford presents in his book. (I recall that it concerns a student who has to measure the height of a building using a barometer. He tried to lower it to the ground on a rope and then measure the length of the rope, or to clock the time of the barometer's downfall, or to compare the length of the shadow of the building with that of the barometer, and at the end simply decided to ask the housekeeper.) This example shows clearly that divergent thinking does not advance our knowledge; on the contrary, we even lose information previously gained by humankind. The testee did not employ the specific qualities of the barometer; he simply used it as an object which has weight.

I would like to point out to my colleagues that in the 1953 article describing the first results of singling out the originality factor, Guilford confesses the following: "We have regarded originality in turn as meaning "uncommon", "remote", "clever". It was felt (something close, reminding –D. B.) that these three definitions included significant aspects of what is commonly meant by the term original" [9, p 363; 13]. The available methods did not allow Guilford to incorporate originality as the true quality which appears in real life creativity, hence he used a substitute: "We have tentatively named this factor originality," [9, p. 369; 13]. Along with the statement that "we are accustomed to think of originality as the core of creativity" [11, p. 55], Guilford honestly points out the relativity and certain arbitrariness of the given factor (according to the way it is being measured) as a creativity criterion. And speaking about the indicators of singularity and distant associations he deliberately refers to H. Hargreaves.

It needs to be mentioned that, although we are used to associate the study of creativity with Guilford, in fact all he did was to empirically continue an existing tradition founded by C. Spearman. While solving the problem of how to measure intelligence, and having singled out its quantitative and qualitative parameters, in the 20's Spearman moved on to study creative thinking. In this connection he assigned to his Ph.D. student Hargreaves the development of criteria for evaluating the quantitative as well as the qualitative productivity of creativity. Naturally, the quantitative part is amenable to assessment which is easily realized via fluency indicators. But how to count quality? Without doubt this is a very difficult problem for a modern psychologist. However Hargreaves relied upon an already existing development: the "banality" coefficients that had been developed by testologists at the beginning of the 20th century. He applied them to quality assessment by using the contradiction principle. The "banality" coefficients themselves are traced back to the works of T. Ziehen, one of the

most famous associationists who had been working on judgement within the framework of logic. Having been convinced that a judgement is just an ordinary association, Ziehen resolves the problem of truthfulness of a judgement by claiming that this should be the closest association. Everybody knows the truth, hence it is a banality. Therefore the farther away we go from the truth, the more distant the association - the farther it is spaced from banality and the higher it is evaluated as an uncommon, non-standard one [2]. This is the source of the main creativity criterion and the true content of the criterion most characteristic to creativity – originality, and an explanation of why its definition is usually based on the ability to produce uncommon, non-standard ideas. The use of this criterion in the above interpretation brings us back to the 19th century.

As a result of the necessity to unify the factors of flexibility and originality into a joint criterion, the principal of multiple answers emerged. Therefore Guilford's combination of these factors into the group of divergent thinking appears as logical. However, the scheme of this principal coincides with the scheme of divergence as a mechanism of evolutionary development only in form. And nevertheless, precisely Guilford's term, which does not coincide with the initial notion of "divergence" (in this case a bifurcation is replaced by the mechanism of remote associations), became a synonym of creative thinking. In this way we see that the criteria for evaluation of creativity are not adequate to the very phenomenon of creativity. In other words the search around, or at its best in breadth, does not provide new knowledge, but at most a possibility for it, or more precisely a probability for it.

At the same time, within the frame of the process-activity paradigm, it was a S.L.Rubinstein's understanding of thinking as a process, which enabled us to single out its determinants. It turned out that the faith of the process is determined by whether a person considers solving a problem as a means for realization of goals that are external to cognition, or he or she sees cognition itself as the goal. In the first case the process stops as soon as the problem is solved. When cognition itself becomes a goal, the process develops. Here we observe the phenomenon of self-motion of an activity that results in a move beyond the given. This act of moving beyond the given, this ability to continue cognition beyond the framework of the requirements of a pre-determined situation, in other words, the externally non-stimulated productive activity, holds the clue to the highest form of creativity, the ability to "see something new in an subject, something that others do not see" [1].

The diagnosed ability to pursue activity on one's own initiative (we use the term intellectual activity or intellectual self-action) cannot be explained only through the features of intellect. It has been proven experimentally that this is a feature of a personality as a whole, that it reflects the cooperation of the cognitive and affective spheres in their integrity (a separation of one of the sides is not possible here), and finally that this feature appears as a unit in the analysis of creativity. In this way, having singled out a unit for the analysis of creativity, we are in position, for the first time, to study creative ability not via its product and

not through indirect indicators, but directly. This is due to the fact that one has singled out the psychological mechanism of the very phenomenon of creativity which determines its occurrence in reality. This feature is represented not on the basis "more-less," but on the basis "there is-there is not."

Metod. Our understanding of creative ability yields also purely methodological principles for the construction of psychodiagnostic procedures. Since the creative act loses the form of a response, the techniques for diagnostics of creativity phenomena cannot consist of tasks that require creativity as a response. That's why our approach to diagnostics of creativity was based on a denial not only of traditional research techniques but also on their underlying model of experiment, and required constructing a new model (Bogoyavlenskaya, 1969). As opposed to the model of problem solving, where thinking takes place in a given space, this model needed to have an extra dimension, in order to allow for another space in which one can track the flow of thought beyond the limits of solving the initial problem. A system of similar problems which at the same time represents some general laws can be used for that. Such a system of problems ensures a construction of a two-layer model of the activity. The first, superficial layer is the imposed activity for solving the concrete tasks. The second, deep layer, which is masked by the superficial layer and is not at all obvious for the testee, is the activity to search for the hidden laws of the system of problems the discovery of which is not required for the solution. The requirement to solve the problem acts as the impetus for thinking activity until the moment when the testee finds and works out a reliable and optimal algorithm for the solution. Any further analysis of the material that is not dictated by the "pragmatic" need to perform the task we call figuratively the second layer. Since the transfer to this layer happens only after the required solution of the problem, and is initiated by the very subject, this enables us to speak about the absence of an outside impetus for this activity. As the creative abilities of a testee can be detected only in a situation of moving beyond the requirements of the initial situation, a limitation, i.e. "ceiling", may exist, but it needs to be overcome. The structure of experimental material should provide a system of such false visible "ceilings" and has to be wide, unlimited. This "absence of a ceiling" in the experimental material does not apply to a single task, but to the whole system which allows for unlimited movement throughout itself. In addition such a movement for the overcoming of false limits, a stair – type movement, can be scaled, unlike the results of "open tasks". This gives the possibility to measure and compare the results.

The principles of the method are the following: 1. Lack of judgmental impetus gives the testee a chance to show his/her own cognitive initiative. 2. Lack of "a ceiling" in the investigation of a given object applies to the entire system; unlike an "open task", the system of assignments allows both to diagnose and measure within the same experiment. 3. No time limits are imposed and each experiment has multiple sessions. While all above requirements can be realized

by the use of different experimental material, their abstraction as general principles forms the new method “Creative field”.

The validity of this method has been proven on about 8000 testees. There have been about 6000 pupils from the first to the eleventh grade from 40 schools in different regions of the country, together with preschool children, and in addition more than 2000 adults from a wide range of professions. Its prognostic power has been checked in a series of longitudes of up to 36 years. In addition to detecting the ability of a subject to develop an activity beyond initial requirements, the method “Creative Field” allows at its first stage to judge the mental capacities of a testee according to the parameters of educability (generality of their acting mode, its character, transfer, efficiency and independence) as well as according to the degree of formation of their operational and regulatory apparatus (completeness of the analysis of the problem, and their search strategy - chaotic, directed). All indicators are being scored and are a part of a general formula. This enables us to determine their correlation with the level of creative abilities. The latter can also be “measured” despite the fact, that we grasp the very existence.

The structure of creative abilities. The reference to psychic processes made possible the emerging of a system. It was shown experimentally (in parallel and longitude studies) that creative abilities are not connected directly with the level of general and special abilities. The latter are of course a means for the successful completion of an activity, but they do not solely determine the creative potential of a person. Their contribution is being refracted through the motivational structure of the individual, through his/her system of spiritual values. Although testologists generally notice the influence of personality in tests of divergent thinking, their instrument is insensitive to the qualitative characteristics of the relationship between the intellectual and personal domains. The method “Creative field” allows to simultaneously untangle the two main components of the creative process (intellectual and motivational-personality) and accurately reveals their roles. Two types of motivation were singled out. They determine qualitative differences in the cognitive process. The domination of cognitive motivation, the interest in the matter itself and not just in personal success, secures a high level of cognitive self-action. Literally: “ the purpose of creative is self-giving, but not glamour, not success”[6]. If the dominating motivation is external with respect to cognition, then the cognitive potential of a person suffers damage. The famous physicist A.Migdal has noticed with great regret that many talents are lost for science because of their unrestrained striving for self-affirmation and showy results [7]. Thus the second type of motivation appears to be an obstruction for cognitive self-action. In summary, the first type of motives stimulate the realization of intellectual potential, and the second type provides an obstacle. This explains why a person with very high mental capacities may not exhibit cognitive self-action, and why people with equal level of mental capacities differ by creative potential.

Types of creativity. Using the entity of ISA as a universal criterion for creativity, the following types of creativity have been singled out.

Stimulated productivity. Even while doing most conscientious and energetic work, subjects remain within their initially found framework. In some of them the new activity itself provokes curiosity and gives a pleasure which lasts throughout the experiment. For others the activity provokes a strong interest while it is new and difficult. But as soon as they master the activity and it becomes monotonous, their interest is exhausted. In this impatient need for new impressions which excite the imagination one can recognize the immaturity of thought, its shallowness. The lack of an inner source of stimulation for the cognitive interest determines the quality of this level of ISA. Its main signs are external stimulation of the thinking process and lack of intellectual initiative although the activity may well have productive character. Tasks are being analyzed by subjects according to their individual features and without reference to the rest. The highest achievements at this level reflect only the high level of mental capacities and are identical to the wide spread notion of "general capacity".

Heuristic. The activity becomes creative by nature. While having a pretty reliable method of solution, the person continues to analyze the contents and structure of his/her activity, compares the separate tasks and as a result finds new patterns that are common for the whole system. These patterns can lead to new, original methods for the solution of a given, i.e. external, problem. Unlike the stimulated productivity level there is intellectual initiative. If at the stimulated productivity level the thinking process serves as a means for realization of an outside goal, on the heuristic level the product of the thinking process is being perceived as a discovery or a creative finding. This finding, however, serves as a side effect, or as an extra result, but not as an objective.

The highest level of ISA is the creative one. The found patterns are not used as means for solution. They are considered as a new problem at the sake of which the subject is ready to abandon the offered experimental activity. Found patterns become a subject to verification through search for a common origin. Here the phenomenon of true goal-setting appears for the first time. In contrast with Guilford's sensitivity to problems, which is the ability to see a defect, here we really deal with posing a new problem.

In conclusion, we stress that the current investigation of creativity takes place within two paradigms.

1.Testological paradigm, in which the vector of development points toward breadth, and divergent thinking as a factor of creativity is represented by the principal "more-less." Based on distant associations, divergent thinking does not have the same content as divergence as a mechanism of evolution which provides creation through the bifurcation mechanism. Therefore divergent thinking does not guarantee gaining of new knowledge, but only provides some possibility for it.

2.The paradigm “process-activity” in which we single out the true phenomenon based on an identification of the unit of creativity analysis. This paradigm is a result of development of the cognition process inward, of “exploding the layers of existence” [8].

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Psychology of education

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Students background formation peculiarities within the changing educational environment

The last decades are characterized by impetuous growth of different aspects of students' learning activity research and educational paradigm shift from education to self-education. These changes are caused by the society demands, by new requirements brought in front the professionals of the future. Modern psychology faces the problem of psychological and pedagogic foundation formation for innovative teaching methods and strategies; their implementation will not only increase effectiveness of education, but self-education as well.

We consider introjection of schema and background knowledge mechanism as a basis for self-education, as a result of which a subject forms "steady functional cognitive construct" which helps him find the way in the changing educational environment, acquire and process knowledge necessary for his professional activity.

Key words: *schema, background, introjections, sense making, intercultural communication, background knowledge, "figure and background", cognitive construct, discourse, heterarchy, contextual semiotic environment, personal meanings, assimilation.*

Last decades in the domestic and foreign psychological and pedagogical literature the problem of an educational paradigm change was widely discussed. The major cause for necessity of such change consists in the fact that social and scientific -technological progress entered into contradiction with educational systems which had developed during the last three centuries. The requirement of our time is that there appeared a necessity for essentially new approach for determination of educational purposes, problems and principles, necessity to reconsider the educational context which is realized in subjects and disciplines, new forms, methods and instruments of training are required.

Last decades of XX century and the beginning of XXI century are marked by prompt growth of researches on various aspects of personal cognitive activity. It is not surprising, because modern educational system in Russia is entering an epoch of active transformation. The human civilization has entered XXI century which is characterized by a priority role of self-education rather than education. In this connection cognitive science was formalized as independent area of scientific knowledge where the subject of investigation are concepts most essential for construction of the uniform conceptual system, necessary for creation of educational environment outlook, meeting requirements of new democratic educational system and social order of the society.