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PROBLEM SPACE OF MODERN SOCIETY: PHILOSOPHICAL-COMMUNICATIVE AND PEDAGOGICAL INTERPRETATIONS

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This collective monograph offers the description of philosophical bases of definition of communicative competence and pedagogical conditions for the formation of communication skills. The authors of individual chapters have chosen such point of view for the topic which they considered as the most important and specific for their field of study using the methods of logical and semantic analysis of concepts, the method of reflection, textual reconstruction and comparative analysis. The theoretical and applied problems of modern society are investigated in the context of philosophical, communicative and pedagogical interpretations.

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PEDAGOGICAL CONDITIONS FOR CREATIVITY DEVELOPMENT IN MATHEMATICALLY GIFTED ELEMENTARY STUDENTS

Abstract. *The paper considers the problems of creative ability development in mathematically gifted children of elementary school age. The conceptual meaning of the notion "mathematical giftedness" is clarified and its pedagogical interpretation in the context of elementary-school age characteristics is analyzed. The criteria, indicators and levels of creativity development in schoolchildren underlying potential mathematical giftedness are determined. It is substantiated the psychological and pedagogical conditions for creativity development in mathematically gifted elementary school students. The methodological framework aimed at their practical provision is presented. It is described the experimental research carried out at the formative stage of the experiment together with its result analysis.*

Introduction.

Reforms to the Ukrainian education system, the reproduction and strengthening of the national intellectual potential take place in the conditions of bringing the Ukrainian science and production up to the world standards, a transition to market relations, and competition in various spheres of activity, including intellectual one. Consequently, the modern society faces the urgent need for talented individuals thinking outside the box who can fully realize their creative abilities, add more insight to the modern understanding of the world and who can easily become civil citizens in today`s society.

In most cases, in our country up until recently this process has occurred uncontrollably, relying only on regional opportunities and individual scientists, educators, artists, and public figures` personal commitment. However, in recent decades there have been created specialized educational institutions for gifted children, privileged schools, institutions for extracurricular education, and some innovative forms of extracurricular activities are organized based on traditional schools.

However, there still exist the substantiated by the author [1] unresolved contradiction between our country`s need for gifted and proactive people who would defend national interests building an economically and culturally developed state and realizing the European choice on the one hand, and the absence of a comprehensive system of psychological and pedagogical monitoring, social and pedagogical support and a search for gifted personalities at the state, regional levels and at the level of educational institutions together with the creation of conditions for their creative self-realization throughout life on the other hand. Moreover, the problem of early diagnostics of different school children`s giftedness types and the creation of comfortable conditions for the development of their ability in the educational process at primary school taking into account each child`s interests, inclinations and individual characteristics is not solved systematically. That is why the ongoing support of gifted children and young people should be one of the state education policy priorities in Ukraine. At the level of science and educational practice, there is a topical problem of addressing the theoretical-methodological, didactic, and methodical problems of finding ways and methods for the development of children`s creative ability of a different nature from the early age.

1. Definition analysis of the key research concepts

The phenomenon of the person`s giftedness is included in the scope of scientists` interest in various fields – philosophers, doctors, psychologists, physiologists, educators, etc. For many years the question of what it means to be gifted, its peculiarities, and the way it is expressed has been a controversial issue and caused heated debate among representatives of various scientific schools. The conducted [2] analytical review of the foreign and domestic scientific sources gives grounds to conclude that talent is a complex phenomenon of an interdisciplinary nature. Scientists reasonably point out that it needs to be investigated comprehensively at the psycho-physiological, psychological, socio-psychological, and pedagogical levels.

O.Savenkov [3] also advocates the idea of studying giftedness from several perspectives. The scientist presents this scientific construct in the form of a vertical axis which graphically permeates several levels: genotypic, psychological, phenotypic, and socio-pedagogical. This, in turn, enables the plurality of methodological and theoretical approaches to the following: explanation of a nature, model, and types of giftedness, the role of creativity in its structure; defining the features of giftedness expression at different ages; substantiation of methods for the gifted personality`s study and recognition, outlining the most favorable conditions and ways of children and youth`s development with different kinds of giftedness, etc.

The generalization [4] of the psychological and pedagogical sources including the works by individual researchers as well as the results of the scientific teams` experimentation on the giftedness problem revealed the following two important tendencies. On the one hand, some scientific research (by O. Antonov, M. Bahramiants, M.Ivlieva, V.Inozemtsev, O.Matiushkin, N.Pinchuk, etc.) are focused on the harmonization, generalization and systematization of the existing concepts and approaches to treatment of the giftedness phenomenon, distinguishing stages, directions, the main tendencies in the concept development and addressing the less-researched and discussed aspects. On the other hand, in modern psychological discourse it has been initiated experiments on giftedness in new scientific perspectives, among which:

- treatment of giftedness as an asynchronous development (O.Bevz, L.Vyhotskyi, K.Dombrovskyi, N.Pomortsev, R.Semenova, J.Terrasse, A.Roper, N.Seldinska, L.Silverman, Ye.Stolbova, N.Telychko, S.Tsvetkova, L.Hollingworth, etc.);
- identification of the age peculiarities of giftedness expression (N.Druzhynin, N.Leites, M.Kholodna, V.Shadrikov, etc.);
- determination of the correlation between cognitive and personal factors in giftedness development (G.Aizenk, D.Holman, K. de Vree, R.Ponomareva-Semenova, Ye. Khudobina, etc.);
- research on gifted children`s social and psychological problems (Y. Babaieva, Yu. Hilbukh, O. Losiievska, O. Savenkov, E. Whitmore, O. Fokin, L. Hollingworth, E. Tsigankova, V. Chudnovskyi, O. Shcheblanovata, etc.).
- analysis of gifted children`s socialization and adaptation difficulties (N. Zavhorodnia, O. Marinushkina, A. Mudryk, A. Petrovskyi, L. Tokarieva, L. Turishcheva, G. Francis, L. Hollingworth, O. Shchelbanova, etc.);
- determination of gifted students` special needs in the context of inclusive education organization (J. Gallagher, O. Zaitseva, I. Demchenko, V. Valietov, N. Lebiedev, I. Karpovich, G. Kit, A. Kolupaieva, N. Otroh, etc.);
- development of ways and methods for training professionals in giftedness development (V.Demchenko, S.Markova, G.Tryhubets, G.Tarasova, I.Ushatikova, V.Ushmarova, M.Fedorov, etc.).

The study and analysis of the psychological and pedagogical literature on the research subject has shown that quite often the categories "skilful", "gifted", and "talented" are used synonymously due to the generally accepted everyday understanding of these terms reflecting the degree of some ability formation. In the pedagogical encyclopedia [5, 186-187], such concepts are explicated and differentiated as follows: giftedness is a high level of a person`s ability development, which allows them to achieve a great success in certain areas of activities; talent is a high level of ability formation which is characterized by its product originality [5, 208]. In addition, in another source when determining the concept of "talent" it is emphasized its innate nature. Giftedness is considered as a state of talent or as a degree of talent. Genius is defined as the highest level of ability development [6, 510].

Yu. Hilbukh in his papers claims that there is a significant difference between the concepts “giftedness” and “talent”. Giftedness is a set of abilities that allow an individual to achieve substantial results in one or several types of activities and bring benefits to society [7, 24]. A talented child has a very high level of ability to perform some kind of activities. The scholar also adds two more features enhancing the meaning of the term: a demonstrated creative element and the prevalence of natural qualities [7, 26-27].

Among numerous theories of giftedness there exists the scientific approach provoking much interest. According to it, this phenomenon is explicated through the category of "ability" (general and special), but without narrowing down its conceptual meaning just to a high level of its development; it is stressed its unique combination in each individual personality, interdependence and interconnection.

For instance, S. Rubinstein [8], examining the essence of giftedness concentrated not just on ability, but its spiral development: the realization of ability at one level opens up new opportunities for further development and the formation of higher-level structures. The person`s giftedness, in his opinion, is determined by the range of opportunities opened up by the realization of the available natural skills. The person`s ability is an internal condition of their development which similarly to such other conditions is formed under the influence of external factors – in the process of interaction of an individual with the outside world.

In addition, in some scientific works giftedness is interpreted not as a particular ability, but as its interconnection and interdependence at different levels. According to B.Teplov, giftedness is a qualitatively unique combination of abilities determining the possibility to achieve success pursuing particular kinds of activity [9, 22]. As it is evident from the foregoing, the author neither focuses only on intellectual ability nor treats mental activity as the foundation of giftedness. Therefore, we may conclude that the ability of any kinds has the same nature, including mathematical. In case the latter is formed at a high level, it will enable a person to effectively perform complex cognitive tasks, be productive and achieve great success. It is worth considering G. Kostiuk`s position who was convinced that giftedness is not solely about abilities, but "the person`s ability to develop them" [10, 341]. In turn, O. Muzyka [11] notes that the fact of giftedness shows the highest level of ability development and, accordingly, the highest achievements in a certain field of activity (absolute or as compared with the age norms).

The more detailed analysis shows that the phenomenon of giftedness is interpreted from the standpoint of the potential originality of human inclinations, relying on which it is possible to develop and form capabilities, ability and skills in a particular field of activity. The complex interconnection of these three factors largely determines the development course of giftedness in an individual [12, 235]. Psychologists [13, 45] argue that inclinations are the foundation on the basis of which special education and upbringing develops and shapes a gifted child`s abilities, which over the course of independent activity acquire the characteristics of talent. Abilities, in turn, express individual psychological characteristics, which are subjective conditions for the successful implementation of a particular type of activity.

We appeal to E. Lodzinska`s position [14] arguing that in modern psychology and didactics the two approaches can be the most clearly identified treating abilities as the basis of giftedness: personal and activity approach supporting external (social) determination of abilities; functional and genetic one whose representatives consider ability to be internally determined and formed under the influence of the external conditions of a child's development. In addition, in recent years in the works by domestic and foreign researchers there has been the tendency to consider general giftedness as creative giftedness. The studies have shown that the concept of "giftedness" has a close connection with the notion of "creative ability". Thus, O. Matiushkin claims that the psychological structure of giftedness coincides with the structural elements that characterize creativity and the person`s creative development [15]. In particular, B. Teplov notes that creative abilities are persistent individual traits manifested in educational, productive and other activities and are necessary natural perquisites for creative development [9, 7]. The personality endowed with creative abilities is characterized by mental agility, flexibility and creativity, curiosity, accuracy and courage [9, 25]. V. Rogozina argues that creative abilities can be equal to a particular type of mental abilities, but they are special because they can generate thinking beyond the requirements not sticking to traditional norms, contribute various original ideas and find ways to put them in practice [16, 28].

In our opinion, the interpretation of the concept of "creative abilities" proposed by V. Chornous gives more insight into its meaning. The researcher believes that such abilities are a combination of the person`s individual traits and qualities which satisfy the requirements of a certain type of creative activity determining its effectiveness and are developed in the process of creative activity on condition that there is a corresponding internal motivation [17, 86]. Thus, creative abilities can be demonstrated in any kind of activity ensuring its success and nonstandard solutions and at the same time underlying various giftedness types. In this respect, attention should be paid to the idea of creativity proposed by J. Guilford. In his terms, the concept “creativity” consists of the main six parameters: originality (adaptive flexibility) – the ability to respond to stimuli in a non-standard way; the ability to solve problems in a new, unusual and non-standard way; productivity – the ability to generate a large number of ideas; flexibility - the ability to produce a variety of thoughts and ideas; the ability to change the form of a stimulus to see new features and opportunities to make use of; the ability to identify and formulate problems; the generation of various ideas in complex and unregulated situations; the ability to improve the object by adding details; the ability to solve problems performing appropriate analytical and synthetic operations [18, 440-448].

We support the idea [19] of creative abilities being a demonstration of giftedness that can be shown in any field of activity in the process of formulation and finding original solutions to problems of various kinds: scientific, technical, pedagogical, communicative, social, spiritual, etc.

Consequently, the phenomenon of giftedness is inextricably connected with such concepts as abilities (general, special, creative), inclinations, talent, and genius. Having analyzed the definitions of the notion “giftedness” given by the scientists from different countries and generations, we may state that it is often interpreted as a specific combination of the person`s ability, needs and interests allowing to achieve great success in a particular field of activity. In research circles in addition to the concept "giftedness", several derivatives are used ("children`s giftedness", "gifted child", "traits / demonstration of giftedness", "characteristics of a gifted child"). There is no precise definition of what is denoted by each of the above mentioned terms. In particular, the construct "gifted child" which nowadays is widely used in the foreign and domestic psychological and pedagogical thesaurus was introduced into scientific use in the second half of the twentieth century. In recent decades there has been active research on specifics of giftedness demonstration in childhood. Having generalized the research findings, we are now able to formulate the following scientific remarks [4]:

- a child is considered to be gifted when the level of their ability development exceeds the generally accepted age norm so that it is possible to achieve greater success in comparison with peers (O. Burov, N. Druzhynin, V. Kamyshyn, V. Moliako, etc.);
- child`s giftedness is treated as a potential which can be either realized or not fulfilled (O. Muzyka, O. Savenkov, O. Schheblanova, etc.);
- children’s giftedness is one of the age giftedness types that is recognized upon the age criterion and can be a temporary phenomenon (N. Leites, V. Yurkevych, etc.);
- in recent years, the number of children who can be considered as gifted has increased (B. Clark, etc).

In the sources of recent years it is stated [4] that the category of the gifted / talented includes those who show a high level of some special or general ability. In addition, it is noted that on average the age when giftedness is identified in different spheres is not the same: the propensity to art is recognized earlier, as compared to sciences; in the scientific sphere mathematical giftedness is formed in the first place.

We share the position of modern Ukrainian scholars who determined children`s giftedness pointing out its specific types. In particular, gifted children are those who are significantly ahead of their peers in intellectual development; children who demonstrate general (in various fields of activity) or special (musical, artistic, technical, psychomotor, and social, etc.) giftedness. It has been identified the contradiction: on the one hand, in the foreign and domestic literature the term "gifted child" is well-established; On the other hand, scientists warn that in educational work with successful children the concept "gifted child" should be carefully used and it is more appropriate to apply the derivative term "child's giftedness" that is also used and explicated in the works of some researchers.

The terms "gifted children" and "children`s giftedness" which are derivatives of "giftedness" are clearly distinguished by O. Savenkov [20] who argues that despite these

concepts having a close meaning and similarities in their graphical form, they signify different psychological and pedagogical phenomena. In his opinion, the concept "children`s giftedness" is analogous to the personal potential (O. Matiushkin, J. Rensulli, etc.); we talk about a certain level of every child`s giftedness (the level of development of this potential). On the contrary, the concept "gifted children" ("gifted child") implies some kind of exclusivity, the possibility that there exist a special group of children who by definition are qualitatively different from their peers. According to the scientist, the word combination "gifted children" refers to a special group of children who are ahead of their peers in development; " children`s giftedness", on the contrary, does not involve selection but indicates that each individual has a certain intellectual and creative potential. As we can see, it is the development characteristics based on which the psychologist differentiates a gifted child from others.

Consequently, based on the results of the scientific literature in-depth analysis, we will consider the concept of giftedness as a high level of human ability development which enables us to achieve outstanding success in certain activities. Taking into account the age and psychological characteristics of elementary school children, we assume a gifted child to be the one who stands out from his peers by bright, obvious, sometimes outstanding achievements (or has an internal potential for doing so) in some kinds of activity that go beyond a generally accepted average level and are based on a creative background. Besides, we are convinced that ability and giftedness are phenomena of the same complexity in the sense of progressing through ability development, that is, we emphasize that there is an opportunity to develop giftedness. At the same time, we believe creative ability to form the basis of elementary school children`s giftedness.

2. Mathematical giftedness and its structure.

As it is revealed over the course of the study, in the literature on the problem of giftedness, there is a tendency, on the one hand, to distinguish its different types, and on the other - to find its structure. In general, the systematization of giftedness types is determined by the criteria (qualitative and quantitative characteristics), which underlie its classification. Qualitative characteristics of giftedness express the specificity of human mental capabilities and the peculiarities of their manifestation in some types of activities. Quantitative characteristics of giftedness can describe the degree of their manifestation [21, 32].

Among the criteria for distinguishing giftedness types there are the following: types of activity and the spheres of the psyche responsible for it; the degree of formation; the form and breadth of expression in various activities; specifics of age development [22; 35]. The analysis of the widespread classifications of giftedness types according to various criteria gives ground to conclude that any individual case of children`s giftedness can be evaluated from the perspective of all the above-listed criteria for the classification of its types. Thus, giftedness is considered to be a multidimensional phenomenon implying the opportunity and, at the same time, the need to have a wider look at specifics of its expression and development in any single case.

According to A. Grabovskyi [23, 15], each type of giftedness involves the simultaneous inclusion of all the psychic organization levels with the predominance of what is the most significant for a particular type of activity; in its manifestations to some extent it covers all the five activity types. We share the scientist`s opinion on the classification according to the criterion "the type of activity and the spheres of the psyche responsible for it " being the most important in the context of explaining the nature of children's giftedness. Assessment of giftedness based on the criterion of activity types allows us to divert from its widespread treatment as a quantitative degree of ability expression and to concentrate on the understanding of giftedness as a systemic quality. In such a case, its psychological structure acts as the objective basis for the integration of individual ability serving as a matrix and forming the set of skills and abilities necessary for its successful fulfillment.

The authors [24] conclude that giftedness is an integral ability manifestation for the purpose of carrying out a specific activity. One and the same kind of giftedness can be of a unique nature as some of its components in different individuals can be expressed in their own ways. Giftedness can only manifest itself if a person`s ability can compensate for the missing or insufficiently expressed components necessary for the successful activity implementation. Particularly brilliant giftedness or talent indicates the ability of a high level, the formation of the entire set of components determined by the activity structure, as well as the intensity of integration processes "within" the subject involving personality sphere.

Taking into account different approaches to the typology of giftedness, in the context of our study we focus on mathematical one. Among the researchers of this problem in the national psychology, the best known figure is V. Krutetskyi who mentions that mathematical giftedness is characterized by generalized, concentrated and flexible thinking in the field of mathematical relations, numerical symbols and signs together with a mathematical mindset [25, 196]. We can assume that the generalization and flexibility of mental processes depend mainly on how deep the understanding of mathematical material is, and its concentrated nature brings the subjective sense of making understanding easier. The latter is connected with the significant reduction of individual thinking chains and the corresponding action system.

Thus, students clever in mathematics can relatively easily abstract from a specific statement and specific data of any mathematical problem, clearly finding out its general formalized structure. That is, in comparison with peers who are less gifted in this sphere, for them it is much easier to determine from the whole variety of concrete unique objects and phenomena of reality their most significant quantitative-spatial characteristics and relations.

The mathematical ability is a specific ability to clearly understand the inner connection of mathematical relations, as well as accurately think in terms of mathematical concepts [26]; the ability to understand and grasp the basic concepts of mathematics and manipulate them [27]; the ability to formulate based on a mathematical material generalized, concentrated, flexible and inverse associations [28].

The diagnostics, formation and development of mathematical ability take place while performing mathematical activities, along with the formation of general training skills on the basis of mathematical knowledge and skills.

Scientists distinguish the following components of mathematical ability:

- skillful transformation of complex literal expressions; computational and algorithmic abilities; geometric imagination or geometric intuition; the art of consistent, correct and segmented logical reasoning [29];

- ability to formalize mathematical material, separating the form from the content; abstraction from real situations, their quantitative relations and spatial forms; operation of structures connected with relations and relationships; ability to synthesize the material; operations with numerical signs and symbols; logical thinking related to the need to prove and make conclusions; ability to simplify the thinking process; ability to move from a direct to an inverted course of thought; flexibility of thinking independent from the influence of patterns [30].

The analysis of the scientific sources gave us [31] grounds to assume that a high level of elementary schoolchildren`s mathematical giftedness cannot be narrowed down to having only mathematical ability, even if it allows a child to achieve a high math performance. We believe that at this age the basis of children's mathematical ability is formed by an integrative combination of mathematical and creative components. At the same time, we are convinced that a large number of children of elementary school age have not actual, but potential mathematical giftedness that is often restrained by some adverse conditions (difficult family circumstances, the lack of motivation, low self-control, or the absence of the appropriate educational environment). Besides, elementary schoolchildren also have hidden mathematical giftedness, which is expressed in an atypical, disguised form not visible to others. As a result, there is a risk of arriving at the false conclusion that such a child lacks giftedness.

Thus, elementary school children`s mathematical giftedness is considered as a special kind of giftedness that manifests itself in their mental activity in the form of specific abilities arising from an integrative combination of mathematical and creative components in the process of acquisition, processing, retention and the use of mathematical information.

Psychologist V. Krutetskyi [25, 118] in the structure of mathematical ability underlying children`s mathematical giftedness has distinguished the following main components:

1. Obtaining mathematical information (the ability to formalize the perception of mathematical material, grasping the formal structure of the problem).

2. Processing of mathematical information (the capacity for logical thinking in the field of quantitative and spatial relationships, numerical symbols and signs, the ability to manipulate mathematical symbols, the ability to quickly and broadly generalize mathematical objects, relationships and actions, the conciseness of mathematical reasoning and the system of appropriate actions, the ability to think using concise structures, the

flexibility of thinking processes in mathematical activity, the desire for clarity, simplicity, effectiveness and rationality of solutions; the ability to change the focus of thinking processes rapidly and rationally switching from direct to a reverse way of thinking.

3. Retention of mathematical information (mathematical memory: generalized memory for mathematical relations, typical characteristics, reasoning and demonstration schemes, methods of problem-solving and principles of their handling).

4. General synthetic component (mathematical mindset).

Such a detailed scheme can be simplified to the most lapidary form. According to it, mathematical giftedness is characterized by generalized, concise and flexible thinking in the field of mathematical relations, numerical symbols and signs, and the aptitude for mathematics [25, 118]. We can assume that the generalization and flexibility of thinking processes determine the depth of mathematical material understanding, while conciseness creates the subjective sense of making acquisition easier.

The conducted theoretical study allowed to determine the components of elementary school-aged children`s mathematical giftedness and the criteria for their recognition. Thus, its structure is composed of the following elements:

1. Cognitive component, its level is assessed based on the formation of the personality`s intellectual sphere. Indicators: level of logical operations (comparison, analysis, synthesis, abstraction, generalization); the development level of logical skills (the definition and use of concepts, making logical conclusions, the establishment of causal relationships between facts, processes, phenomena in accordance with the laws of logic, the ability to find out and substantiate source data, evaluate them and the results of problem-solving); independence while performing tasks; the desire to share with others acquired knowledge, engagement in educational activities regardless of external incentives offered by a teacher; the scope of acquired knowledge; the ability to solve advanced problems

2. Need and motivation component that is determined based on the unity of the personality`s emotional and volitional traits. Indicators: a positive attitude to the learning content and process; perseverance, determination, patience, diligence, independence in overcoming difficulties; self-organization in learning; the formation of moral and volitional traits (self-criticism, self-confidence, the ability to maintain one`s ground, etc.); enduring interest in certain activities and perseverance in achieving the goal; the need for cognitive activity and pleasure derived from both a process and its results.

3.Creative and pragmatic component that is assessed based on the creative nature of cognitive activity. Indicators: the manifestation of creative abilities in all kinds of activities; a non-standard approach to the solution of educational and everyday tasks; ingenuity; high efficiency; achievement of top or outstanding results in one or several types of activities as compared with other children; copious active vocabulary, the speed and originality of association words, rich imagination; application of educational achievements, skills in new situations.

3. Development levels of mathematical giftedness foundations in elementary school children

Given the specifics of giftedness in childhood, modern scientists consider comprehensive psycho-pedagogical monitoring to be the most appropriate way of identifying its traits in children. The approach involves the analysis of various aspects of the child's behavior and activities.

Taking into account the results obtained in the study by O. Matiushkin who argues that the psychological structure of giftedness coincides with the structural elements that characterize creativity and human creative development [15], we focus our attention on the development of creative ability in elementary school children (integrated with mathematical ability) forming the foundation of their mathematical giftedness.

In order to determine the development level of creative ability integrated with mathematical one underlying potential mathematical giftedness, it has been conducted the ascertaining experiment where 580 fourth grade students, their parents and teachers took part.

To study the level of creative ability development in mathematically gifted elementary school-aged children, we`ve used the methodology of O. Savenkov. The scientists offer six levels of giftedness manifestation at this age: *high* (the personality`s creative manifestations are well developed, clearly expressed, and demonstrated in various activities (5 points)); *sufficiently high* (creative manifestations are distinct, but expressed sporadically with opposite traits being found very rarely (4 points)); *sufficient* (the personality`s creative basis and stereotypy are vaguely and rarely expressed and in time perspective while performing some activity counterbalance each other (3 points)); *average* (traits opposite to the investigated phenomenon are more common and clearly demonstrated (2 points)); *low (*traits opposite to the quality under examination are clearly expressed and is fixed for a long time and in all types of activities (1 point)); *zero*: there are no prerequisites for evaluating creative manifestations (0 points) [20, 97-98].

We began our diagnostics with the parent survey based on the test "Do not miss the wunderkind!". It was conducted for once during the teacher-parent meeting in a calm and business atmosphere because parents should be the first to recognize their children`s hidden inclinations and abilities. The answers were evaluated according to the key proposed by the author of methodology [32, 47].

To preliminarily determine pupils` special aptitudes, it was conducted the survey of the homeroom tutors and other teachers working in the classes that participated in the experiment according to Haan and Kaf [32, 44]. In accordance with the author's interpretation of the obtained results, more than 13 points - there are grounds to talk about giftedness; from 10 to 13 points – some individual abilities have been revealed; up to 10 points - no signs of giftedness.

The analysis and comparison of the answers given by the parents and teachers according to both methods enabled us to make the first preliminary distribution of respondents by ability types, therefore, allowing selecting the children for more in-depth individual research. Besides, some children showed a high level of giftedness not in one sphere, but in several fields. In addition, it was noticed that not always the teachers` and parents` views were the same. Certain clarifications had to be made after studying the students' intellectual and creative ability with the help of the comprehensive questionnaire [33, 41] which addressed such personality spheres as memory, attention, ability to analyze and synthesize, the productivity of thinking, perfectionism (diligence), flexibility and the originality of thinking. It should be noted that the application of this methodology allowed us to obtain preliminary information on the development level of the personality intellectual sphere (the cognitive component of giftedness) and the creative character of cognitive activity manifestation (creativity and pragmatism).

To study the ability of elementary school students to establish regularities, we used the method "Regularities of numerical series". The children were offered 20 numerical series. Each series is constructed according to a certain mathematical regularity. The pupils had to read these lines, determine the pattern of each one and add the numbers “seven” and “eight” which would continue the series without violating its regularity.

The assessment was carried out according to the number of correctly established regularities (17-20 series – 5 points, 16-14 series – 4 points, 13-10 – 3 points, 9-6 – 2 points, 5-3 – 1 point, 2-0 – 0 points). The results of the methodology application revealed that only 92 students received 5 and 4 points, while 327 students scored 2 and 1 points.

In addition to this technique, the study of the cognitive component of mathematical giftedness was conducted with the help of the test "Test yourself (your ability)" [34]. The generalization of the results and the calculation of the points was done according to the algorithm proposed by the author (12 solved tasks is an excellent result, 9-11 – very good, 6-8 – average, 4-5 – low). The results obtained using the described methodologies were corrected in the process of long-term monitoring for the children in various activities (educational, gaming, extra-curricular, etc.). This allowed all the respondents to be divided into six groups according to the levels of the personality intellectual sphere development which shows the development level of the cognitive component of elementary school children`s mathematical giftedness (Table 1). For the sake of simplicity in the presentation of the results, instead of the level names in all tables we use their numerical equivalent expressed in points.

To study the need and motivation component of elementary school children`s mathematical giftedness according to the criterion of unity of emotional and volitional personality qualities, it was used “the Questionnaire of Overexcitement” consisting of 22 questions aimed at establishing the peculiarities of a person`s mental and emotional states, namely, the overexcitement of imagination, emotions, mental processes peculiar to a gifted personality.

While analyzing the scientific sources on the research subject, it was established that the gifted child has a personal need for cognitive activity and satisfaction both from the learning process itself and from its results. In view of this we used the test to determine the need for achievements developed by Yu. Orlov, V. Shkurkin and L. Orlova [35].

The next step in our experiment was to discover the dependence of cognitive activity on various motives. To conduct the experiment, we partially used the adapted method introduced by V.Krutetskyi [25]. This technique involves conducting four series of experiments. In the first series of experiments, the influence of the content component of tasks on the interest of elementary schoolchildren in the procedural component of the study was tested (the children were asked to solve 20 problems, of which 15 were based on an interesting or humorous story about animals, modern cartoon, fairy tale heroes and 5 tasks - with a standard problem situation from a school textbook on machines and combines, etc). It was given the instruction - to solve any 10 problems out of 20 proposed. There was no explanation given as for what problem to tackle. The point was to identify what tasks will be chosen by the elementary school students to solve.

In the second series of experiments students were presented with the set of tasks that can be solved in different ways. After a special explanation and demonstration they were solved in different ways under the guidance of the teacher. In the third series of experiments the students were offered to solve their tasks independently in different ways with a notice that the second and all subsequent methods of solving problems would be evaluated separately, and the teacher would take them into account in the final assessment. The tasks were solved individually in writing. The pupils did not know their classmates` results.

In the fourth series of experiments the pupils were offered to try their hand in the search for different ways to solve problems focusing on identifying an optimal one. This task was performed in the game situation with the direct competition, that is, in this series of experiments the incentive was a competitive motive. To analyze the results of the experiment, it was taken into account the number of solutions and the time spent by a student to complete the task (a new way of solving the problem was offered after classes for what it was set 30-minute time span). Besides, for studying the school children`s motives it was used the following methods: students` oral reports, observation of their activities, conversations revealing the students` attitude to study. The observation showed the school children`s orientations, independence, observation, interests, activity motives.

The low results of performing standard tasks from the textbook (only 1-2 choices) indicate that in order to boost cognitive activity, children need to be offered problems corresponding to their age-specific features; more consideration should be given to games when teaching new material and to interesting conditions when solving problems. The third and fourth series are valuable for our study, as their results indicate the value of the game competitive motive. The fourth series revealed the motive of self-actualization by comparing oneself with others ("I want to be not worse than others"). It should also be noted a high emotional tension, a positive attitude to the task.

All the above-mentioned facts are illustrative of elementary school children`s cognitive interests being not yet sufficiently formed, and children, as a rule, are guided by situational factors of personal meaning.

After summarizing the results of all the diagnostic procedures, comparing them with the results of the conversations with the students and the teacher together with conclusions based on our own observations, each student was given the appropriate number of points, which gave grounds to determine the development levels of the needs and motivation component of mathematical giftedness according to the criterion of unity of emotional and volitional personality qualities. The results are presented in Table 1.

To study the development level of the creative and pragmatic component of giftedness according to the criterion of the manifestation of cognitive activity creative nature, we used the test by J. Gilford and the Short Indicative Test (SIT) developed by L. Zagorskyi, A. Shmelov and adapted by V. Baguzin [14] used to determine the ability of an individual to creatively solve problems. The implementation of the above-stated methods and processing the received results was carried out according to the traditional procedure.

It should be noted that we received the valuable diagnostic material for determining the formation level of the last component constituting giftedness while observing the children and teachers` work in math classes and in extracurricular activities. In addition, the results of studying the products of the students' activity and clarifying conversations with the teachers, students and their parents were taken into account. According to the above-mentioned results, each student received the corresponding number of points that enabled us to determine the development level of the creative and pragmatic component of the elementary school children`s mathematical giftedness according to the degree of the creative character of the individual`s cognitive activity (Table 1).

Table 1. Development levels of mathematical giftedness in the elementary school children

Levels (points)	**0**		**1**		**2**		**3**		**4**		**5**	
Components	**Q**	**%**	**Q**	**%**	**Q**	**%**	**Q**	**%**	**Q**	**%**	**Q**	**%**
Cognitive	54	9,3%	98	16,9%	214	36,9%	109	18,8%	56	9,7%	49	8,4%
Need and motivation	43	7,8%	77	13,3%	178	30,7%	143	24,7%	78	13,4%	61	10,5%
Creative and pragmatic	55	9,5%	107	18,4%	226	39,0%	102	17,6%	49	8,4%	41	7,1%

Based on the results of all the three sub-stages aimed at studying the formation levels of the individual components comprising mathematical giftedness, each respondent was assigned a numerical coefficient corresponding to the sum of points obtained in the three sub-stages. It enabled us to determine the development level of the mathematical giftedness foundations based on the following gradation: 15 -13 points – high; 12-10 points – sufficiently high; 9-7 points – sufficient; 6-4 points – average; 3-1 point – low; 0 points – zero. The summarized results of the diagnostics of elementary schoolchildren`s mathematical giftedness are shown in Figure 1.

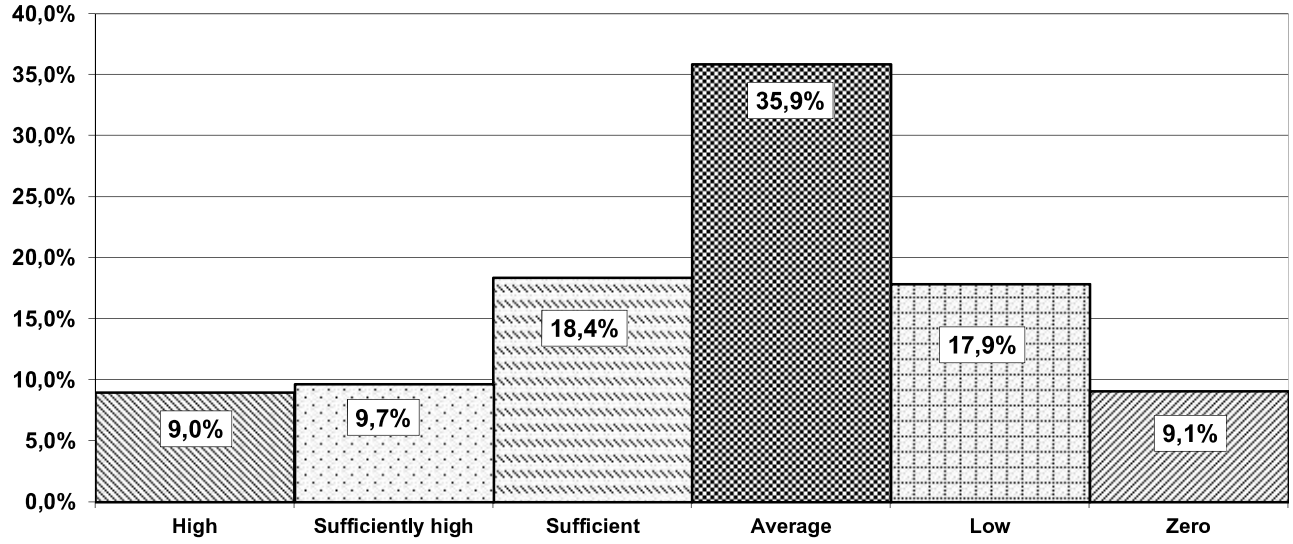

Fig. 1 Distribution of the elementary school children according to the development levels of mathematical giftedness foundations

Upon completion of the ascertaining stage of the experiment, we selected two groups of children, control (CG) – 56 students and experimental (EG) – 60 students for further work. It should be noted that the students` distribution of both groups according to the development levels of creative ability in general has minor differences. The same is true for its separate components. These differences are not statistically significant (Table 2).

Table 2.Development levels of creative ability foundations in the elementary school children

Levels	*CG (56 students)*		*EF (60 students)*	
	Quantity	*%*	*Quantity*	*%*
High level	6	10,7%	5	8,3%
Sufficiently high level	5	8,9%	6	10,0%
Sufficient level	10	17,9%	11	18,3%
Average level	18	32,1%	21	35,0%
Low level	9	16,1%	11	18,3%
Zero level	8	14,3%	6	10,0%

Consequently, the results of the ascertaining phase revealed only a small number of elementary school students who showed a high level of actual mathematical giftedness and not all of them are excellent mathematicians. Among the reasons for this situation, we see the following:

1. The current education system in most cases focuses on the "average" student. Traditional conditions of the pedagogical process do not correspond to gifted children`s high potential and sometimes result in poor progress among pupils.

2. Pupils with a high and sufficiently high level of intellectual ability, mathematical and creative potential do not always have the opportunity to fully implement them since the most experienced teachers are often biased towards non-standard methods of organizing the pedagogical process that is adequate to the needs of gifted students.

3. Gifted children`s development is hampered by the lack of social and material resources in primary schools that are needed to spot gifted children, their creativity; standardized education system; the lack of psychological help for gifted children; a wrong approach to talented children in the family resulting in negative consequences.

4. Psychological and pedagogical conditions of creative ability development in mathematically gifted elementary school children.

The study and analysis of the psychological and pedagogical sources on the research subject [31; 1; 24; 36, etc.], as well as the results of the ascertaining experiment allowed us to identify the psychological and pedagogical conditions ensuring the recognition, maintenance and development of mathematically gifted elementary school children`s creative abilities. These are the following:

1. Recognition of the child to be an equal subject of instruction oriented to the priority of creative thinking development over the informational (knowledge) acquisition.

A pupil becomes an equal partner of a teacher in an educational process only when they do not copy from a model but have the opportunity for an alternative solution. In this case, the pupil has the freedom to choose, it makes the learning process conscious and productive. The pupil is given the right to make a mistake which in turn encourages children to an independent creative search since a gifted child can build their own personality only independently.

Therefore, all work carried out should be nonintrusive, indirect and for a long term perspective, aimed at activating students` educational and cognitive activity through creative, problem, research methods gradually transferring the initiative to organize their own cognitive activity to gifted pupils. Acknowledging children`s right to acquire their own methods of education is of paramount importance.

2. Activation of the child`s emotional sphere aimed at transforming the cognitive content of mathematics into an emotional one in the context of each type of educational and cognitive activity

This means that in order to develop mathematically gifted children`s creative ability it is necessary to systematically address their own emotional experience, to facilitate their interest in educational and extracurricular activities. As it is widely known, we can clearly remember only what strongly influenced the soul, caused positive emotions. In addition, the emotional coloring of educational and cognitive activity contributes to free choice, liberation, creative ingenuity, the dominance of independent research practice on reproductive learning, and increases the motivation of the child to study. Consequently, for the productive development of mathematical ability, it is necessary to emphasize the language of feelings, use a variety of images, associations, metaphors, irony, and humor.

3. Organization of a pedagogical process in elementary school on the basis of creativity (the key characteristic of which is the creation, not the reproduction of knowledge and skills).

Personality qualities of the teacher (empathy, value orientations, flexibility of behavior, the tendency to positive thinking, subjective control), peculiarities of the thinking sphere (cognitive needs, creativity, flexibility of thinking, tendency to work under uncertainty, ability to solve divergent tasks) a prerequisite for effective collaboration with gifted students both in math classes and in extracurricular activities. The teacher's ability to familiarize the child with productive forms of activity (O. Matiushkin) creates the necessary preconditions and requirements for the formation of pupils` personality traits, which when perfected contribute to the further development and realization of the individual potential of creative mathematical giftedness. Forming the subjective readiness of the child for mathematical creativity which is expressed in showing a positive attitude to creative tasks, along with the objective characteristics of activity, the teacher determines the success of their solution and the subjective value of the activity for its performer (V. Moliako, O. Rodina).

4. Special training provided to teachers at higher education institutions to work with gifted children.

A facilitator and pedagogue as a partner plays an important role in the formation of a talented person and in the process of self-development and self-realization. While studying at university such a teacher should acquire appropriate competencies, so that he would be able to timely diagnose children`s giftedness manifestations and to model the individual trajectory of their personal growth.

In the context of reforming the system of higher pedagogical education we believe [1; 2] that the training of specialists with the psychological and pedagogical background for them to be prepared to work with gifted children should be a separate direction. The results of the theoretical research show that special attention is required to mathematically capable individuals who are generally not considered to be potentially gifted. The higher education system faces the challenge of preparing a teacher for gifted children who would have the appropriate competence and be able to create a favorable and comfortable environment for the personal growth of each talented and creative child. In terms of the educational process, higher education institutions consider it necessary and possible to introduce a system of future primary school teachers` training to develop children`s giftedness in the cultural and educational space which is formed on the basis of the synergistic integration of universal cultural and pedagogical as well as special training for professional activities with children demonstrating a high ability level.

Consequently, the implementation of the proposed psychological and pedagogical conditions and guidance by the principles of the teacher`s pedagogical creativity will contribute to the development of mathematically gifted elementary schoolchildren`s creative ability. Strengthening children`s motivation for learning and cognitive activity, ensuring subject-to-subject relations between a teacher and pupils, and the use of the system of creative tasks provided that teachers receive appropriate training will facilitate gifted children`s creative self-fulfillment.

5. Methodological framework for the provision of the psychological and pedagogical conditions ensuring creative ability development in elementary school children.

The purpose of the formative stage of the experiment was to effectively manage the process of creative ability development in elementary school children which underlies their mathematical giftedness, to give students the opportunity to actively participate in the process of teaching mathematics, to actualize their creative potential by creating appropriate psychological and pedagogical conditions.

In developing the program for this experiment stage, we took into account the results of the theoretical analysis of what constitutes elementary school children`s mathematical giftedness and the results of the ascertaining stage of our study. Therefore, it was necessary to develop a pedagogically grounded methodological framework aimed at the provision of the distinguished psychological and pedagogical conditions for the development of creative ability in elementary school students. However, it is important to emphasize that mathematically gifted children`s education and development can take place not only in specialized institutions but also in general schools because all children are creative in their nature and have creative potential to develop their capabilities. If the child's ability does not find its full and creative development, then the adult (teachers, parents) are to blame for such a situation, since they either did not create the conditions necessary for natural ability development or suppressed it by sticking to "dogmatic" methods of learning. Therefore, it is necessary to focus on the creation of an enabling creative environment built on the subject-to-subject interaction in any type of educational institutions.

In the context of the aforementioned, the formative stage of the experiment was conducted with the experimental group - 60 respondents studying in the fourth form (two classes). While carrying it out, we adhered to the following positions:

1. Departure from the idea of personality formation and holding to the position of their development facilitation.

Every gifted child, in particular, mathematically capable for successful personal growth requires the creation of a friendly atmosphere in classes and extra-curricular activities in mathematics involving: flexible and dynamic involvement of each participant in the pedagogical process into the subject of the lesson; giving the child the opportunity to express their own thoughts without evaluating judgments, ensuring pluralism of thoughts and judgments, tolerance to the views of others in creative activity and evaluating its outcome; tolerating students` mistakes, but with a compulsory analysis of what causes difficulties and how to overcome them; a gradual reduction in the share of educational guidance, etc. All the above mentioned points will be possible to realize through the teacher's faith in every child`s creative potential, ability and aptitudes, taking into account the individual mental and intellectual peculiarities, the reliance on pupils` desire to express themselves and to realize their potential interacting with other personalities as an individual, and giving the student the opportunity to freely choose the content, methods and forms of creative activity.

It is important to use methods and techniques that will stimulate the autonomy of students` mental activity, to encourage them to take a stand, to give arguments, facts, and use the acquired knowledge; ask questions to a teacher and classmates, to find out what has not been comprehended, to immerse themselves in study; to analyze and review classmates` answers, essays, other creative activity types, make some remarks, give advice; share knowledge with others; help classmates to overcome difficulties, explaining them what has not been understood; perform advanced tasks entailing consulting literature, primary sources, or long-term observations; to encourage students to find not the only solution, but a few independent options; practice free task selection, mainly of a searching and creative nature; to offer situations implying self-examination, analysis of personal cognitive and practical actions; engagement in a variety of activities, including the elements of labor, play, artistic, social and other activities.

2. The use of non-standard problems and tasks in math classes.

Problems and tasks (both standard and non-standard) play a defining role in the development of students` mathematical thinking. By solving them, children are trained to formulate correct conclusions, identify the essentials, compare and contrast the facts, look for common features and relationships between concepts, to single out known source data and unknown search results. Problem-solving gives a boost to such skills as self-contained argument where ungrounded generalizations and analogies are not acceptable and the holistic analysis of a problem situation is required together with the manifestation of analytical and synthetic activities. Pupils develop the special way of thinking characterized by the clarity in constructing a formal and logical reasoning scheme and the conciseness expressing private viewpoints, the inductive and deductive logic of substantiation, and unambiguousness. However, if an educational process is only based on standard tasks which are solved by a strict algorithm, it cultivates in children the habit of stereotyped thinking and constrains their initiative. As a result, in each specific case children may raise barriers by themselves which prevents many of them from looking for non-standard options or methods while analyzing and solving problems. During the formative phase of the experiment, we used our system of non-standard tasks. We believe that solving non-standard tasks is the art that can be mastered only as a result of a deep, continuous self-analysis of the activities necessary for solving problems and ongoing training. In addition, it is a type of creative activity, and the search for a solution is an invention process.

3. The use of creative exercises that facilitate the development of creative background in mathematically gifted students.

From our perspective, such exercises include: search for new ways of solving problems; writing and solving students` own tasks; writing "math" works; solving open-ended creative tasks that have more than one correct answer; search for interesting mathematical riddles and logical tasks; arrangement of personal exhibitions dedicated to teachers and students` creative works; creating students' own themed catalogues; students` activity organization in math classes around problems in the form of stories, jokes, and with heroes of funny fairy tales, creation of game situations and funny competitions, etc.

4. The use of active teaching methods CIT (creative imagination development) as an element of the TIPS-technology (Theory of Inventive Problem Solving)

The use of the TIPS -technology elements and active teaching methods was quite effective at the formative stage of the experiment, among which we distinguish the following.

The method of heuristic research: the object of research is selected and students are asked to investigate it according to the following plan: objectives of the study, its outline – facts about the object – experiments - drawings of experiments – new facts – questions and emerging issues – answer options – hypotheses – conclusions. For example, explore a geometric figure – the rhombus.

The devising method is a way of creating a product that was previously unknown to students as a result of some mental activity. For example: to come up with the definition of a number, a concept; to give a definition of an object or phenomenon studied; to formulate some mathematical regularity, and so on; to make up a mathematical tale; a mathematical crossword; a game, a quiz, a problem book of students` own tasks; prepare a model, mathematical figure, geometric garden.

The brainstorming method. The main task is to collect as many ideas as possible on any topic. The goal is achieved by discussion participants departing from the inertia of thinking and stereotypes. The method "If ...": The students are encouraged to imagine and describe what will happen if something happens in the world. For example, all solid geometric figures will turn into planar and vice versa.

A gifted child fully develops when they try to independently master the world around experiencing pleasure from research, learns to solve non-standard problems, and seeks new approaches to solving standard situations. The formation of creatively oriented personality with non-standard approaches to solving problems and independence of thought requires purposeful development of both logical and creative components of thinking. The latter is based on the former as a reliable foundation.

Thus, our methodological framework was aimed at the provision of the psychological and pedagogical conditions for the development of mathematically gifted children`s creative ability, implementation of which in the long run should lead to quantitative and qualitative changes in the levels of creative ability development in elementary school children. The latter underlies their mathematical giftedness.

6. The analysis of the experiment results.

At the end of the formative stage of the pedagogical experiment, we conducted the control analysis in both the control and experimental groups according to the method used at the ascertaining stage (in addition to the parent survey). Only the texts of the tasks were subject to change, and the level of their complexity was increased. The results of the control analysis indicated the following:

1. In the experimental group (EG) there were significant positive changes in the levels of formation of the personality intellectual sphere. Thus, the children of this group in most cases demonstrated the high level of logical operations (comparison, analysis, synthesis, abstraction, generalization) and logical skills (the definition and use of concepts, making logical conclusions, the establishment of causal relationships between facts, processes, phenomena in accordance with the laws of logic, the ability to find out and substantiate source data, evaluate them and the results of problem-solving).

While performing mathematical tasks, they showed independence, there was almost no need for additional motivation coming from the teacher. For most respondents in this group, the problem of increased complexity did not cause difficulties. It should be mentioned that an increase in the knowledge component. Besides, it positively affected the pupils` math performance.

There were also some positive changes in the control group (CG), but they were not as significant as in the experimental one. The dynamics of changes that occurred in the experimental and control groups regarding the levels of the cognitive component formation of mathematical giftedness is given in Table 3.

The repeated study of elementary schoolchildren`s emotional and volitional qualities showed that positive changes in the motivational sphere took place in the children from the experimental group, namely: a positive attitude towards the content and process of studying had increased; there was a steady interest in certain activities and determination in achieving the goal, the need for cognitive activity. They demonstrated perseverance, determination, patience, diligence, independence in overcoming difficulties, self-organization during educational activities. In the structure of the moral and volitional qualities, self-criticism, self-confidence, and the ability to take a stand became more expressed. It was noteworthy detail that children had forgotten about being afraid of making mistakes, and therefore, even those pupils who did not show high ability wanted to try their hand in solving problems of increased complexity. At the same time, they derived pleasure both from the process itself and from the result of their activities.

Table 3. Dynamics of formation levels of the cognitive mathematical giftedness component in the elementary schoolchildren

Mathematical giftedness levels	***CG (56 students)***				***EG (60 students)***			
	The beginning of the experiment		*The end of the experiment*		*The beginning of the experiment*		*The end of the experiment*	
	Q	***%***	***Q***	***%***	***Q***	***%***	***Q***	***%***
High level	5	8,9%	6	10,7%	4	6,7%	9	15,0%
Sufficiently high level	5	8,9%	7	12,5%	5	8,3%	10	16,7%
Sufficiently level	10	17,9%	10	17,9%	11	18,3%	20	33,3%
Average level	20	35,7%	18	32,1%	23	38,3%	15	25,0%
Low level	9	16,1%	11	19,6%	11	18,3%	6	10,0%
Zero level	7	12,5%	4	7,1%	6	10,0%	0	0,0%

As for the control group, in which case on the contrary, according to some indicators there was a decrease in the motivation for the study. This is especially true for such qualities as the need for educational and cognitive activities, the ability to overcome difficulties and defend their own point of view. The children of the control group, for the most part, felt the fear of making a mistake that negatively affected both the process of mathematical material acquisition and the results. The dynamics of changes that occurred in the experimental and control groups regarding the formation levels of the need and motivation component of mathematical giftedness is presented in Table 4.

2. The research of the creative and pragmatic component in gifted elementary school children showed that children of the experimental group demonstrated their creativity and mathematical ability at a higher level. Their educational and cognitive activity in the math classes was of a creative nature. They are much more likely than the pupils of the control group to have a non-standard approach to the solution of educational tasks and real-world situations, resourcefulness, high performance, achievement of high and outstanding results in one or several types of activities, rich imagination. Active vocabulary, speed and originality of word associations had significantly increased. The dynamics of changes that took place in the experimental and control groups regarding the levels of development of the creative and pragmatic component of mathematical giftedness is given in Table 5.

Table 4. Dynamics of formation levels of the need and motivation mathematical giftedness component in the elementary schoolchildren

Mathematical giftedness levels	***CG (56 students)***				***EG (60 students)***			
	The beginning of the experiment		*The end of the experiment*		*The beginning of the experiment*		*The end of the experiment*	
	Q	***%***	***Q***	***%***	***Q***	***%***	***Q***	***%***
High level	6	10,7%	5	8,9%	4	6,7 %	13	21,7%
Sufficiently high level	8	14,3%	4	14,3%	8	13,3%	12	20,0%
Sufficient level	14	25,0%	16	28,6%	17	28,3%	23	38,3%
Average level	16	28,6%	18	32,1%	18	30,0%	9	15,0%
Low level	8	14,3%	7	12,5%	8	13,3%	3	5,0%
Zero level	4	7,1%	2	3,6%	5	8,3%	0	0,0%

Table 5. Dynamics of formation levels of the creative and pragmatic component of mathematical giftedness in the elementary school children

Mathematical giftedness levels	***CG (56 students)***				***EG (60 students)***			
	The beginning of the experiment		*The end of the experiment*		*The beginning of the experiment*		*The end of the experiment*	
	Q	***%***	***Q***	***%***	***Q***	***%***	***Q***	***%***
High	4	7,1%	4	7,1%	3	5,0%	9	15,0%
Sufficiently high level	5	8,9%	6	10,7%	6	10,0%	11	18,3%
Sufficient level	10	17,9%	11	19,6%	13	21,7%	22	36,7%
Average level	22	39,3%	21	37,5%	21	35,0%	14	23,3%
Low level	10	17,9%	10	17,9%	12	20,0%	4	6,7%
Zero level	5	8,9%	4	7,1%	5	8,3%	0	0,0%

In order to identify the levels of mathematical giftedness in the elementary school children, the obtained data on the development levels of its components for each respondent were transformed into standard points. The generalization of the results obtained during the ascertaining and control stages of the experiment allowed to reveal the dynamics of elementary school children`s mathematical giftedness levels according to all the distinguished criteria and indicators presented in Fig. 2.

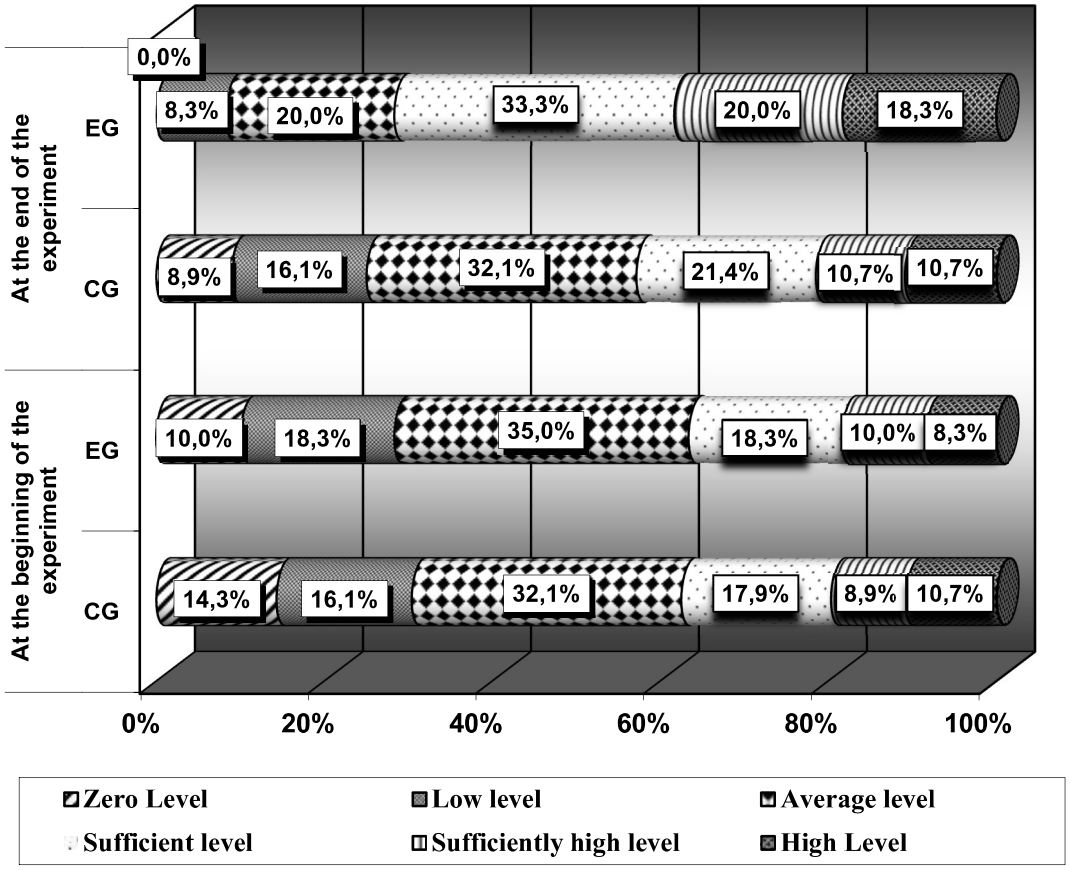

Fig.2. Distribution dynamics of the elementary schoolchildren according to the development levels of mathematical giftedness foundations

Consequently, according to the results of the control stage of the experiment, 18.3% of the students in the experimental group had a high level of mathematical giftedness as compared to 8.3% at the beginning of the experiment, a sufficiently high level was peculiar to 33.3% as compared to initial 10%, a sufficient level was identified in 20% of the students, a low level had only 8,3% (as compared with 18,3% of the respondents at the beginning of the experiment). It should be noted that a zero level was not detected (at the beginning it was 10%). In the control group, according to the analysis of the processed data, there was an insignificant dynamic pattern: the number of students with a high level of mathematical giftedness remained unchanged (10.7%); a sufficiently high level was identified in 10.7% of respondents as compared with 8.9% at the beginning, a sufficient level was peculiar 21.4% of the students compared with initial 17.9%; an average level had 32,1% of the participants, a low level was identified in 16,1% of respondents both at the beginning and at the end of the study; a zero level decreased from 14.3% to 8.9%.

Thus, the analysis of the above-mentioned results shows that the implementation of the proposed psychological and pedagogical conditions which are substantiated by the methodological framework contributes to the development of creative ability in mathematically gifted children of elementary school age.

Conclusions.

The study and analysis of the psychological, pedagogical, and methodological sources on the problem of children`s giftedness give grounds to conclude that the questions about nature, characteristic features of giftedness, the essence of its manifestation have been controversial for many years and caused heated debate among representatives of various scientific schools. However, today the notion of "giftedness", which is associated with such phenomena as ability, inclinations, talent, and genius is used in different meanings.

Based on the results of the in-depth analysis of the scientific literature, we treat the concept of giftedness as a high development of human abilities enabling them to achieve great success in certain activities. Taking into account the age and psychological characteristics of elementary school children, we assume a gifted child to be the one who stands out from his peers by bright, obvious, sometimes outstanding achievements (or has an internal potential for doing so) in some kinds of activity that go beyond a generally accepted average level and are based on a creative background.

Judging from the fact that ability and giftedness are phenomena of the same complexity in the sense of progressing through ability development, it has to be stressed the fact that there is an opportunity to develop giftedness. At the same time, we believe creative ability to underlie elementary school children`s giftedness.

The analysis of different approaches to giftedness typology according to different criteria has made it possible to define elementary schoolchildren`s mathematical giftedness as a special kind of giftedness that manifests itself in their mental activity in the form of specific ability arising from an integrative combination of mathematical and creative components in the process of acquisition, processing, retention and use of mathematical information.

Relying on the scientific achievements by V. Krutetskyi in the structure of children`s mathematical giftedness it has been distinguished the cognitive, need and motivation as well as creative and pragmatic components. It is also distinguished the criteria and indicators for each component.

Given the specificity of giftedness in childhood, the complexity of its diagnostics (the need for the long-lasting diagnostic process and the multiplicity of conducted surveys), the ascertaining stage of the experiment was focused on the study of development levels of creative ability in elementary school children (integrated with mathematical ability), which form the basis of their mathematical giftedness.

The results of the ascertaining stage of the experiment showed that only a small number of elementary school children had a high level of actual mathematical giftedness.

Among the reasons for such a situation the following are defined: the traditional education system in most cases focuses on the "average" student and does not correspond to gifted children`s high potential sometimes resulting in poor progress among pupils; many teachers are biased towards non-standard methods of organizing a pedagogical process that is adequate to the needs of gifted students; the lack of social and material resources in primary schools that are needed to spot gifted children, their creativity; standardized education system; the lack of psychological help for gifted children; a wrong approach to talented children in the family.

It has been substantiated the psychological and pedagogical conditions the introduction of which will help to identify, maintain and develop mathematically gifted elementary schoolchildren`s creative ability. The methodological framework for the provision of the proposed psychological and pedagogical conditions is developed.

The results of the control analysis carried out at the end of the forming stage of the experiment proved the effectiveness of the proposed psychological and pedagogical conditions based on the appropriate methodology.

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