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THE PROBLEM OF FORMING MATHEMATICAL CONCEPTS IN SCIENTIFIC AND EDUCATIONAL LITERATURE

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The article examined the problem of the formation of mathematical concepts from different points of view represented in the psychological and educational literature. Formation of mathematical concepts is considered as a complex psycho-pedagogical process that has certain stages.

Key words: mathematical concepts, stages of concept development, a learning process.

Relevance. The Great Soviet Encyclopaedia concept is interpreted as follows: «The concept: 1) (philosophy) form of thinking reflects essential properties, connections and relationships of objects and phenomena. The basic concept of a logical function - allocation of the total, which is achieved by means of distraction from all the features of individual objects of this class. 2) In logic - a view which summarizes and highlights the objects of a class according to certain joint and combined these features specific to» [5, c. 1050].

Analysis of the literature. From a philosophical point of view, the notion - the result of generalization based on the abstraction of insignificant traits, in which is formed a set of features that characterize the class of objects or phenomena [1, c. 378].

The concept is an important element of the theory of knowledge. There are two types of levels of knowledge - empirical and theoretical. Empirical level - a direct study of objects of reality, aimed at collecting data, it can be regarded as effective for any study. Indeed, no study is not possible without a material on the basis of which put forward hypotheses and build theory. Empirical evidence proving a particular theory or hypothesis, can be detected after a theory or hypothesis formulated. Empirical judgment record isolated facts which are direct

reflection of the state of affairs by which observed, and these are opposed to theoretical, empirical judgment. Theoretical level - a research facility using rational and logical methods. At this level, formulate hypotheses, theories and laws are able to explain if not all, most of the facts that have been obtained using empirical methods. Act as part of the theory is closely related to judgments that are the union of the concepts within the statements. Hypothesis - is also remarks that a general nature, but it is significantly different from expression-law. If the law - is the result of knowledge, it is always a hypothesis is formulated as a proposition which has yet to be tested for compliance with reality. This means that the hypothesis can not be regarded as the result of knowledge.

The main element of theoretical cognition is a theory - a set of interconnected generalized rules. Theories are often evaluated as something that is not unfounded and based only on speculation. A more cautious in this respect was the position of Kant. Kant believed that not all "theoretical" construction, ie, concepts that are not based on facts sufficiently to deserve the name of "theory." Thus, the theory can be called only building the human mind, which able to explain the phenomena that give them meaning and human existence in general. This means that the theory has always been closely associated with the practice and, even more, practice without theory is simply impossible. In a broader sense, this means that if we have no theory, and facts at our disposal, we can not explain. Theory is always summarizes data obtained through empirical methods [1, c.218].

From the psychological point of view, the notion is specific content of thought. «The concept - is indirect and generalized knowledge about the subject, based on the disclosure of its more or less significant objective relations and relations» [6, c. 311].

Statement of the material. The full dialectical concept examines the phenomenon of the internal relationship of all parties, in the unity of the internal contradictions in his concrete life and development. The "change" the interdependence of all concepts, the identity of opposites, in the transitions of one notion to another, eternal change, movement concepts of thinking more deeply

penetrates into the concrete reality of life in a moving internal contradictions of development, that is just a concept and not a word not the general idea is the specific content of thought.

Revealing the connections and relationships, going from appearance to generalized knowledge of their essence, the concept becomes abstract, without visual character. The meaning often can not afford to visualize, but you can realize or know. Its objective determination revealed indirectly and beyond the direct visibility. The form of the existence of the concept is the word.

Any thinking, in one way or another, going on in terms. However, the real thinking process concept does not appear to be eliminated, isolated form, they always operate in unity and interpenetration of visual ideas and points to the word that, as a form of existence of the concept is always at the same time in any hearing or visual image [6, с. 476] .

Visual elements are included in the thought process: a) in the form of visual images of objects and their properties, and b) a scheme, c) in the form of words, which operates conceptual thinking, as it always is thinking verbally.

The thought process usually includes, in unity and interpenetration of concepts in the first place, more or less generalized images of presentation. Not only abstract meaning, but visual image can be a carrier of semantic content, value and do more or less significant features in the thinking process, so that the image is not a sign of a closed mind, but there is a semantic entity that designates the subject. but images like this with great clarity proves the existence of metaphors and general creative thinking.

The image of the image of the object has semantic meaning. Each subject received or submitted image appears usually in connection with a certain value, expressed in the word: it indicates the subject. When a person clearly, vividly perceives something, it recognizes the subject, the subject-sensitive content it refers to the object that is using it perceives. This semantic content is the common denominator for the image and word-concepts, their semantic community

overcomes the usual opposition logical-conceptual and figurative sense, including both as a necessary link in the actual thought process [6, c. 523].

Engaging in the thought process and doing it the semantic function, an image he built in intelligence. Performed by him in the course of mental function, generalized value sensitive carrier which it is, makes it sensible in as little cross out, at the forefront of its features are the ones that are associated with its value, others for him unimportant, incidental, consequential, recede into the background, taper off. As a result, the image becomes more perfect carrier of thought, in the sense-his visual sense is adequately reflect its value. The final stage of the intellectualization of the image, which makes it a clear expression of thought, is the transition of the material submitted to the circuit.

Along with specific words and visual images, scheme plays an important role in thinking. Man is not always thinking in detailed verbal formulations, thought sometimes ahead of the word. If the idea works fast, people like to place outlines thoughts in a system and then fast, rapid roll as on a chessboard, moves opinions. In such cases, it operates on the basis of some scheme which provides for conscious yet no comprehensive system of thought. Based on this scheme, not burdened with details, can operate faster marks. Why not stay for thought: when a quick-thinking person thinks that way. Visual images and charts are not all visual-sensory components of thought. Fundamental to thinking in terms of speech is the word.

Thinking in terms of - mostly verbal thinking. The word, as already noted, is a form of thought exist. The great advantage of word is that sensory-visual material word itself has no other meaning apart from its semantic content, which is why it can be a plastic carrier in terms of the content of thought. Words so clear as to meaning: a person usually begins to notice how the words sound images only when no longer understand their significance, because of the word - the most suitable means of designation intellectual content of thought. But the word - a form of thought - is not just an abstract value, but the visual sensory perception [6, c. 530].

Thus, in various forms is carried out close intertwining of logical thinking in terms of visual content. Logical abstract thinking inseparable from all sensible and practical basis. Logical and sensory-visual form is not an identity, but unity. This unity is manifested in the fact that on the one hand, thinking comes from sensual perception and incorporates visual elements, on the other hand - it is visual-figurative content includes semantic content. Visual and abstract meaning in the process of thinking interpenetrate each other and each other's move.

Thus, the actual thought process, keeping the specifics of thinking, essentially, qualitatively distinguishes it from all other mental processes, however, is always woven into the overall fabric of holistic mental life, really present relations and interpenetration of all parties of mental activity - to the needs of and feelings of volitional activity and commitment, with visual images, verbal representations of form and language. Specific to thinking as thinking process is its focus on the problem or task, and thought as its content - generalized reflection more essential aspects of being in concepts, judgments and conclusions that lead to man's knowledge is more profound objective ties world.

The concept though is associated with the concept of different transitions, however, differs significantly from it. In the psychological literature, they are usually identified, bringing the concept to the general idea, or oppose outside, taking the concept of an idea, or, finally - at best - outside the same proportion to each other.

In fact, the concept can not be reduced to any idea or pull it. They are not identical, but there is unity between them, they are mutually exclusive, as opposed to as a visual representation of the image-but have no visual, presentation - even common - reflects a phenomenon in its more or less immediate effect, and to overcome the limitations of the concept of the phenomenon and reveal its important aspects of their relationship. However, the concepts and ideas are interrelated and penetrate into each other and the essence of the phenomenon, the general and the individual in reality. In the actual process of thinking ideas and concepts discussed in some unity. A good image-representation in the process of

thinking is usually more summarized. This schematization is not limited to the impoverishment idea signs to a simple loss of some features - it usually turns into a kind of visual image reconstruction, which resulted in the image appear on the front are the visual features of the object, which is objectively the most typical and almost essential for it; non-essential features like drop and recede into the background.

In educational psychology and pedagogy concepts are considered as elements of social experience. In terms of recorded achievements of previous generations. Students should make it a social experience to their individual experience, the elements of his mental development [7, c. 78].

Concepts learned man becomes a way, but a special way: abstract and generalized.

In terms of formal logic concept - this idea that fixes it displayed signs of objects and phenomena that distinguish these objects and phenomena related to them. Mathematical concepts reflect our thinking in certain forms and relations of reality, abstracted from real situations [4, c. 105].

The concept differ in scope and content. In terms of understanding the class of objects that relate to this concept, combined it. When the meaning of concepts to understand the system of essential properties, for which there is an association of data objects in a single class. The set of properties, which are combined into a single class of objects, called the necessary and sufficient features. The relationship between these features in various different concepts. Some terms of these features complement each other, forming together the meaning, according to which objects are combined into a single class. An example of these concepts in mathematics can be a triangle, the angle bisector and many others. In the logic of the concept of such a bond is called conjunctive features: features related to the conjunction "and".

In other terms the relationship between the necessary and sufficient features like: they complement each other, and replaced. This means that one sign is equivalent to another. An example of this type of relationship between variables

can serve as signs equal segments, angles. It is known that the class of equal segments include segments such that: a) when imposing the same or b) separately or equal to the third, c) or are composed of equal parts, etc.

In this case, the signs are not needed all at once, as is the case with conjunction type concepts, there is enough of any one of all these features: each of them is equivalent to any of the others. Because of the symptoms associated linker "or". This connection is called a disjunction signs, and the notion respectively disjunction.

It is also important to consider the division of concepts into absolute and relative. Absolute concepts combine items into classes according to certain features that characterize the nature of these objects as such. Thus, the notion of angle reflects the properties that characterize the nature of any angle itself.

If objects are relative concepts are combined into classes with properties that characterize their relationship to other objects. Thus, the notion of perpendicular straight fixed that characterizes the ratio of two lines one to another intersection, education in this angle.

Experience shows that the relative concepts in students caused more serious difficulties than absolute concept. The essence of the difficulty lies in the fact that students do not consider the relativity of concepts and operate them as absolute concepts.

To distinguish one concept from another there is no need to list all of its essential properties. Suffice it to those that are necessary, and all together - sufficient to distinguish the concept from all others. From this perspective, and is based definition proposal, revealing the content (meaning) of the term [7, c. 188-191].

Definition of mathematical concepts can be given in different ways. In the scientific literature, there is no single methodological approach to the classification of methods of determining the mathematical concepts. However, you will notice that most of them are a particular case of definition by genus and species differences. The logical structure of almost all definitions can be in the form: B =

{x / x є A i P (x)}, where *B* - class of objects consisting of *x*:, belong *A* - nearest kindred, and tend *P* - species difference [4, с. 105].

Species differences can specify different ways:

а) listing a set of properties;

б) constructively, indicating the method of constructing (receiving);

в) inductively;

г) through negation.

There are certain requirements for the definitions of mathematical concepts:

- The definition should be relevant, it should be the essential features that are necessary and sufficient to distinguish defines other concepts;
- The definition should be minimized not contain unnecessary requirements;
- The definition must not contain logical circle;
- When you enter using the definitions of concepts to avoid homonyms - the use of the same term in different senses;
- The logical definition of a formula which can not be removed or to which you can not add a single word without distorting its meaning;
- The definition can not substitute its sign, the definition should be the word "called";
- The set of significant independent properties given in the definition may be asked ambiguous, instead of this species differences can be taken any other, only that it was a necessary and sufficient condition for this concept;
- Speaking about the correct definition in terms of logic, it is necessary to prove its existence; [4, с. 105-106].

L.S. Vygotsky first introduced in the psychology division concepts to scientific and unscientific - "everyday", while he was not referring to the content of digestible concepts and the way of assimilation [2, с. 129].

The child finds a system of concepts that prevailed in the society. The acquisition of this system is always going through adults. By systematic schooling for adults are not special work of formation of concepts in children. They are usually limited to pointing out correctly or incorrectly classifies a child subject to

the relevant concepts. As a result, the child learns the concept by "trial and error". Moreover, in some cases, actually going through orientation irrelevant grounds, but because of their combination in subjects with essential within certain limits, it turns out true. In the other - there is guidance on the essential features, but they remain unconscious. If the main attribute is not understood, LS Vygotsky saw specifics so-called life concepts. This assimilation of concepts does not reflect all aspects of specifically human way of acquiring new knowledge.

It is quite another, LS Vygotsky considered when a child goes to school. The learning process involves the transition from the natural course of the child in activities focused, organized. The concept formed the child in school, characterized by the fact that their assimilation begins with understanding the essential features of the concept, which is achieved by introducing the definition [2, c. 224].

The idea of the activity approach as a basic methodological directions for the organization of the process of learning and the formation of concepts gained significant importance due to the emergence of scientific works of scholars such as L. Vygotsky, Mr. Halperin, S. Rubinstein, B. Talyzina et al.

Knowledge of the essential features of the concept could change the course and nature of cognitive activity only when these features will be included in it as a guide, that will actually participate in the process of solving the tasks assigned to students. As usual in the educational process is not provided, then by the learning of students mastering everyday and scientific concepts, a large part of the students is very similar manner.

Knowledge does not provide the essential features of conscious use them in the orientation of the relevant activities.

In psychology, noted that the process of mastering the concept, awareness of the importance of the word or term occurs in constant interaction, the interdependence of the two ring each in the second transition operations: a) the use of a concept of operation for a period, its application to a particular case, that is putting it at one time or other specific, clearly presented, objective context, and b)

its determination, the disclosure of its value due to a generalized understanding of relations that define it in the context of a generalized conceptual [2, c. 39].

Mastery of concepts occurs during their use and handling them. When the concept is not applicable to a particular case, it is for the individual loses its conceptual content.

Conclusions. Thus, the formation of concepts - a complex psychological process, long time. However, there is an initial phase associated with the identification of what constitutes, in designing its definition or description. This step is very important because depending on the level at which learned the meaning of, reflected in determining the success of future work with him. The combination of all the essential features that characterize a concept called content and concept reflects the essence of the concept. However, to define the concept, as mentioned, there is no need to specify all features within the meaning of the term. To do this, choose the ones each of which is necessary, and together sufficient to characterize this concept. Whatever kind of had the structure definition, an important effect in terms of the formation of the concept is to distinguish its characteristic properties and fixing them in specially chosen form.

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