

THE PUPILS' EDUCATIONAL & RESEARCH ACTIVITIES ESSENCE & DIDACTIC FUNCTIONS IN THE MATHEMATICS STUDY

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The Abstract. The content of the «teaching and research activities of the pupils» notion has been revealed, the didactic functions of the pupils' teaching and research activities have been characterized, and **also** the educational research stages have been presented in this paper. The role of the mathematics teacher in the teaching and research activities of the pupils organization has been shown, the factors, that are contributed to the pupils' teaching and research activities formation have been indicated. **Moreover**, the didactic units, on the basis of which it is advisable to be organized the teaching and research activities of the pupils in the process of the mathematics learning have been shown.

The Key words: the teaching and research activities of the pupils; the didactic functions of the teaching and research activities; the structure of the educational research; the mathematical research problem.

The individual pupil's, his intellect, emotions, **and** the will development is being carried out only in the active vigorous activity and the active work. So, the human psychology is not only revealed and quite seen, but it also is being formed in the activities, and it is not able to be developed outside of its activities. So, the pupils' ability to the teaching and research activities of the pupils is efficiently being developed only in the process of their reasonably organized vigorous activity and their active work under the teacher's guidance.

We need to be created **all the necessary** conditions, conducive to the pupils' cognitive needs emergency in the knowledge acquisition and their further mastering, in learning the methods, how to be used all of them. So, the pupils' thinking development is able to be carried out not only through the acquisition and their further mastering of the various subjects' specific knowledge, but also through the abilities and the skills **further** development just to the independent thinking activity.

So, the pupils' research activities success, is, mainly, provided by the right kinds and the forms of the planning tasks, by the efficient tasks systems use, and also by the teacher's able leadership in this activity.

Thus, having expanded the teacher's role in the educational research organization, we'll note the following his actions system: the ability to be chosen the necessary level of the academic study carrying out, depending on the pupil's thinking development level; the ability to be combined, as the individual, well as the collective forms of the researches carrying out in the classroom; the ability to be formed the problematic situations, depending on the academic research level, on its

place in the lesson's structure, and also on the lesson's purpose.

In the process of the teaching and research activities, the pupils are being mastered some skills of the observation, the experimentation, the **necessary** facts comparison and their generalization, **and also they** make the certain conclusions. The educational and research activities developmental function in mathematics is that in the process of its **further** implementation, it is taken its place the methods and the thinking style mastering and the learning, which are characteristic to mathematics, the conscious attitude education to their experience, the creative activities characteristics and the cognitive interest formation to the quite various mathematics aspects.

The motive for the educational research is able to be served the interest, the self – contradiction, which is caused the need, the schoolboy's desire to be studied the uncertainty research, having contained the knowledge, which are quite unknown to the pupil. For all this, the challenge situation is the condition for the occurrence of the internal contradictions activities at the subject. So, the challenge situation fixation (e.g. the basic contradiction isolation) has been ended by the challenge formulation – the research objective.

Thus, the special role in the intellectual development of the pupils is being played their teaching and research activities, which is directly connected with the mathematical knowledge acquisition. Therefore, the successful solution of the challenges, having faced by the school, may be, by the pupils' familiarization for the teaching and research activities, and the capabilities **further** development to it in the training process.

So, the main academic research indications are the following: the cognitive challenge definition and the research's objectives; the independent implementation of the research work by the pupils; the educational research direction of the pupils for the quite new knowledge receiving for themselves; the educational research direction for the didactic, developing educational, and teaching purposes implementation.

Thus, for the essence of the educational research notion discovering, it is quite possible to be singled out its specific characteristics:

- 1) the educational research – this is the research cognitive activity process (e.g. the study, the identifying, the establishment of something, and etc.);
- 2) the educational research has **practically** always been directed to the new knowledge generating, that is the research is always started with the need to be known something new;
- 3) the educational research is assumed the pupils' independence, while performing the task;
- 4) the educational research should have to be directed to the didactic teaching purposes realization.

Having taken their part in the educational research, the pupils are being taught by the mathematical activities, because they directly are being carried out this **kind of** their activities. The educational researches are being created, in their own way, the **special** platform for the active thinking activities of the pupils.

So, the educational research, as the mathematics teaching method, is not only being formed, developed the pupils' thinking, but it also is provided the highest type of the thinking formation – the creative thinking, without which it is quite impossible the creative activities.

The analysis of the educational knowledge and the learning activities notions is allowed us to be concluded, that the learning and the research activities should be considered, as the single teaching and research activities, for the teaching and educational process organization, on the basis of the research activities of the pupils.

So, under the teaching and research activities of the pupils, it is quite understood the learning activities on the practical and the theoretical knowledge acquisition, with the predominantly independent scientific methods of the cognition application, which is the condition and the means of the **further** development at the pupils' creative research skills.

The educational and research activities structure is determined by the following components: the teaching and research task, the teaching and research actions and the operations, the monitoring and the evaluation actions.

So, the teaching and research activities general methods, having aimed at the practical – specifically and the theoretical tasks and the challenges solving are the teaching and research activities content.

Thus, to the factors, having contributed to the teaching and research activities of the pupils formation, may be included the following: the personality – oriented approach to the learning; the orientation focus on the productive results achieving; the challenge – based teaching, as the creative activity experience development instrument; the optimal combination of the logical and heuristic methods of the challenges solving; the learning process creative organization, the maximum its saturation by the creative situations; the situation creating of the joint exploratory activity; the educational process detailing; the psychological atmosphere creation; the optimal conditions for the creative activities.

The conditions, conducive the educational and research activities of the pupils activation, are the following: the friendly atmosphere in the staff; the individual and the collective forms of the learning combination; the educational material structuring on the basis of the **following** cognitive difficulties growth of the academic work; the pupils adoption by the rational techniques of the cognitive activities; the internal incentives formation to the learning, to the self-education, and etc.

The pupils' familiarization for the teaching and research activities can be practically

realized through the specific research challenges solving, or through the additional work on the task.

Under the research challenge we will mean the intellectual activity object, in which the constituent elements have been presented in the dialectical unity: the subject, the condition, and the requirement to be obtained some cognitive result at the **following** relationship disclosure between the known and the unknown challenge elements.

So, the schoolchildren involvement in the educational and the learning researches should be gone in the both directions – the content, and the organizational ones. The substantial independence is **usually** reflected in the fact, that the pupil could, without any assistance from aside, be set before himself the learning task and be presented the **further** progress of its solution. **Then**, the organizational independence is expressed in the pupil's ability to be organized his work on the resolved challenge solving.

Thus, there is the challenge before the teacher to be found out the efficient forms and the methods of the learning activities of the pupils, which would not be simply involved them into the research activities, but they also would be promoted learning most of these activities. In the final analysis, it is necessary to be organized the cognitive activity of the pupils in such a way, that the educational research procedure would be assimilated by them together with that content, in which it is carried out.

Thus, under the academic and the learning researches, we'll understand this kind of the cognitive activities of the pupils, which are helped the following skills formation: to be obtained the new subject knowledge, the techniques, and the methods of actions; independently to be organized the **necessary** search; to be achieved their resolved learning objectives; to be formed the mental operations, such as the analogy, the classification, the generalization, and etc.

The process of mastering and learning of the mathematical knowledge analysis, having carried out by us, has been shown, that the teaching and the research activities of the pupils to be organized appropriate for:

- a) identifying essential properties of the concepts, or the relationships between them;
- b) establishing links of this concept with the others;
- c) reading the fact, having reflected in the theorem statement, in the theorem proving;
- d) generalizing of the theorem;
- e) compiling of the inverse theorem, and verifying its truth;
- f) allocating special and particular cases of some fact in the mathematics;
- g) generalizing quite various and different challenges;
- h) classificating of the mathematical objects, the relationships between them, the basic facts of the given branch of the mathematics;
- i) solving the challenges in the quite different ways;

j) compiling the new challenges, having arisen from these data solution;

k) compiling the contrary instances, and etc.

To the main didactic functions of the teaching and the research activities, we refer the following:

- the discovery of the new functions (e.g. unknown to the pupil) knowledge (e.g. establishing of the essential properties of the concepts; the identification of the mathematical regularities and the laws; the search for proofs of the mathematical statement, and etc.);

- the function of in-depth study of the knowledge (e.g. the definitions obtaining, which are equivalent to the initial one; the **already** studied theorems generalization; the different and the various proofs finding out of the studied theorems, and etc.);

- the function of the learned knowledge systematization (e.g. the relationships establishment between the concepts; the interconnections identification between the theorems; the educational and the learning material structuring, and etc.);

- the function of the pupil's **further** development, his transformation from the object of study into the subject of management, the formation at him independence to the self-rule (e.g. the self-education, the self-discipline, the self-realization);

- the function of the pupils' learning methods of their activities.

The analysis of the researches stages, having singled out by the various authorities, is allowed to be made the conclusion, that the obligatory of these are the four ones, which are being formed the basic structure of the academic and the teaching activities: the statement of the challenge; the hypothesis advancement; the hypothesis testing; the conclusion.

In a more detailed analysis of the teaching and the educational research structure, it can be identified and its stages, such as:

- the teaching and the educational motivation;
- the challenge statement of the research;
- the available information analysis on the considered challenge;
- the experimentation (e.g. the measurements, the tests, samples carrying out, and etc.) for the purpose of the actual material getting;
- the received actual material systematization and the analysis;
- the hypothesis advancement;
- the hypotheses' confirmation or its refutation;
- the proof from the hypotheses.

So, it is so evident, that the different types of the researches have their own peculiarities and the special features; therefore, their own combination of the given steps is quite characterized for each of them.

Thus, our experience, and the experience of other teachers have been shown, that efficient learning means and the further development is the educational researches organization, the purpose of which is consisted in the fact, in order to help the pupils independently to be discovered their own new knowledge and the methods of activities, to be deepened, and to be systematized the learned material.

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