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Development of Junior Pupils Research Skills in Interrelation with Universal Learning Activities

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Actuality of the studied problem is stipulated by the fact that the learning activity is the leading one for pupils and it defines development of main cognitive particularities of evolving personality. As the result of this activity becomes formation of cognitive motives, research skills, subjectively new knowledge and ways of activity for pupils. Purpose of this study is to define more significant in pedagogical relation research skills of junior pupils in context of their interconnections with universal learning activities. In the experiment, there were involved 270 people: pupils and teachers of elementary school and also students acquiring profession of elementary school teachers. As the experimental area there became general education schools №81 and №32, gymnasium №37 in Kazan city of Russian Federation Tatarstan Republic. During the work there was used complex of diagnostic methods for revealing development level of research skills and universal learning activities of junior pupils. On the basis of the obtained results there were specified and substantiated the content of research skills of elementary school pupil in context of their interconnection with universal learning abilities (personal, regulative, cognitive, communicative).

Keywords: learning, research skills, universal learning activities, systemic-active approach in teaching, organization of learning and research activity of junior pupil

INTRODUCTION

Relevance of the subject

In purpose of fulfilling demands of Federal state education standard, now practicing teachers of elementary school apply active teaching methods (Gromova & Alimbekov 2015), such as project and research ones. It is explained by the fact that in recent years, there is seen increasing necessity in pupils to participate in learning and research activity. This is confirmed by results of teachers and pupils survey in several Kazan city schools (№70, 81, 32, 37), (about 90% of teachers think that it is needed to bring pupils into learning and research activity; about 70% of pupils would like to be occupied in such activity when studying subjects), and also every

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year there increases the number participants in various scientific conferences carried out in the city.

Scientific works on research activity of pupils have rich history, though since moment when research method came into pedagogics, mainly attention was paid to learning researches in natural-science and humanitarian fields. Nowadays, these trends in research activity of pupils continue to keep priority (Leontivich, 2003).

Problem statement

It is noticed, that there increases the involvement of pupils into intensive learning and research activity. At the same time, analyzed content of presented contest works of pupils and their conference reports leads to conclusion that in most of the cases such activity of pupils is not completely self-dependent.

Unfortunately in teaching practice there remains tendency to spontaneous formation of research skills. Mainly pupils continue to work with book: they write reports, essays, compositions, presentations which do not give higher development level in account of triteness, limitedness by narrow themes. In a lack of purposeful, planned work on formation of junior pupils research skills, insufficient use of productive forms and including ones into search work, teachers cannot achieve higher results in self-dependent learning and research activity of pupils.

This point of view is confirmed by directors of project and research works of pupils in several schools and gymnasiums of Kazan city (8, 86, 125, 37 and others). They inform that about 50% of school children do not have skills self-dependently to propose and substantiate hypothesis, make plan of activity, think about purpose, fulfill search and analyze needed information, carry out experiment, compare obtained data, summarize, and distinctly represent report. The reason of this is in the fact that school children are not taught to research activity. Pupils have to work according to algorithm given by teacher when they do not have prior training, basic knowledge and skills that define character of research activity. Preparing for such kind of activity has to begin at elementary school.

METHODS

There was analyzed psychological and pedagogical literature, was summarized advanced Russian and foreign experience, also there was applied inquiry-diagnostic method (included observation, making surveys, doing tests).

Before the experiment there was done work program. Its logic was in the following: to define the level of junior pupils preparedness to research activity, to reveal initial level of junior pupils research skills, to realize the system of learn tasks (learning activity) and experimental project tasks with the use of informational and communicative technologies (extracurricular activity) and show changes that took place.

On the basis of achieved data there were attempts to define interrelations of research skills with universal learning activities of junior pupils.

The term “universal learning activities” means ability to learn, ability of pupil to get new socially significant experience. Also this term can be characterized as combination of activity ways which provide pupil’s ability to self-dependent acquiring of new knowledge and skills. The term “research skills” is defined as “ability of pupil to fulfill intellectual and practical activities that correspond to scientific-research activity and go within logic of scientific research based on knowledge and skills acquired in process of studying foundations of science” (Ushachev 1988).When looking at the structure of research skill, it is seen that skill has definite set of actions which help to fulfill learning-research activity. The content of actions is defined by concrete research skill.

Research behavior is one of the main sources that give children notion about world (Novik & Podgórecki 2015). In pedagogical psychology and in pedagogics, there is special term-"research learning". It denotes approach to teaching that is built on the basis of children's natural wish to self-dependent learning of environment that surrounds them. The main purpose of research learning is formation in pupils the ability self-dependently, creatively to master and reconstruct new way of activities in any area of human culture.

In Russian standards of the second generation there are underlined four units of universal learning activities: personal, regulative (also including self-regulation), cognitive, communicative. The unit of personal universal learning activities includes activities on self-determination of an individual (in one's life, in one's personal ways), activities in reasoning and moral-aesthetic estimation, and also orientation in social roles and in interpersonal relations. If bring into correlation this unit with research skills, then it combines the ways of activities that are represented in skills: to see the problem, to propose hypotheses, to represent results of one's work.

The unit of regulative activities includes the actions that provide organizing by pupils their own learning activities: purpose formation, planning, prognostication, correction, estimation. In should be accentuated that the shown elements are also characteristic for learning and research activity. In pedagogy this unit usually called as organizational general learning skills and it is considered as main, basic.

In unit of universal activities of cognitive direction there are distinguished general learning (self-dependent outlining and formulating the cognitive purpose, searching and choosing of needed information, applying the methods of informational search ability to structure knowledge, deliberately and voluntarily make speech utterances in verbal and written form and so on), universal logical activities (analysis, synthesis, comparing, classification, resuming to notion, pointing the consequences, setting causal investigatory links, constructing of logical discourse chains, making proves, proposing hypotheses and establishing them), activities in stating and solving the problem including the problems of creative character. So in this way the unit of cognitive activities correlates with such research skills as ability to propose hypotheses, to see problems, to make questions, to classify according different features, to structure the material, to say comments, to prove the correctness of one's ideas.

The fourth unit of universal learning activities are communicative activities: planning the learning collaboration with teacher and schoolmates; defining the purpose, function of participants, ways of interrelation; making questions- initiative collaboration in searching and getting information; solving conflicts; handling the behavior of partner; ability completely and exactly to express one's thoughts according to tasks and conditions of communication; ability to lead monologue and dialogue forms of speech. The content of this unit correlates with following research skills: to make questions, to make discourse, to prove the correctness of one's ideas, to represent the results of work.

In Russian standards there are shown necessity of purposeful formation of creative activity and research skills during lessons. Application of research and learning activity:

-lets get realized maximum self-dependence and creative activity of pupil;

-helps in formation and development of creative thinking, in imparting research approach to fulfillment of practical work;

-supposes mastering by pupils available scientific methods of researching the processes and phenomena.

Scientific approach to research process in pedagogical practice demands using a number of principles, in particular:

-principle of naturalness, here the problem has to be not fictional but existing, the interest has to be not false but real;

-principle of awareness about the problem, purpose, task and also about research process and its results;

-principle of independent activity, when pupil masters research process only through living it, through one's own experience;

-principle of obviousness, when pupil learns the world not only by books but in a way as it is;

-principle of cultural conformity, it is important to take into account that tradition of sensing the world that exists in the chosen culture, tradition of interrelation that takes place in the observed social community.

Let's look at the links of research skills with learning activities in some subjects in elementary school:

1. Ability to see the problem.

Subject: Mathematics.

Tasks: Find text with excessive or insufficient content. Take out groups of similar objects among presented and give titles to these groups. Correlate common titles and different object. Formulate various common titles of different objects.

Subject: Native language.

Tasks: Compose a story as solving the problem on the given theme or on the plot pictures working individually, in pair, in team. Write "Diary of impressions", which of the negative impressions would you like to change?

Subject: Environment.

Tasks: Make observation of natural phenomena. Collect the material based on conversations with relatives about Russian holidays, about home city, about generations in the family and genealogy, about past of native land, about renowned people, customs, festival of nations populating the land.

2. Ability to propose hypotheses.

Subject: Mathematics.

Tusks: Describe phenomena and events using numbers.

Define the signs, which meanings change when there are done certain actions.

Subject: Literary reading.

Tasks: Propose notional parts of discussion. What differences can be in discussions-explanations and discussions-arguments? Show the example of discussion. What if make reference to the rules, to laws? Consider several proofs (arguments in discussion). Use citation in discussion. Use facts (scientific, from everyday life, concrete, generalized) in discussion. Find introduction and conclusion in discussion.

Subject: Environment.

Tasks: Recite possible differences of natural objects and artificial objects. Compare and find the differences in objects of animate and inanimate nature. Prognosticate weather phenomena and changes in climate. Compare conifer and flower plants. Compare insects, fish, birds, animals. Compare the ways of nutrition, reproduction and information interchange of animals. Compare and find differences in wild and domestic animals. Assume unbelievable events in animate and inanimate nature, explain why did these things happen. Define year season using description, find relation in day and night change, rotation of Earth and its movement round the Sun.

3. Ability to give questions.

Subject: Native language.

Tasks: Listen to answers of classmates and give them questions, say your own point of view, comment situation, express agreement or disagreement with opinion of classmates and teacher. Make various questions for specifying information, understanding what was said. Compare various ways of delivering information (pictures, pictograms, hieroglyphs, letters). Compare texts written in different styles.

Subject: Environment.

Tasks: Prepare questions to forthcoming excursion (in school, in neighborhood, to regional museum, to local industries).

Subject: Literary reading.

Tasks: Make questions to the composition that has been read.

4. Ability to classify according to various signs.

Subject: Mathematics.

Tasks: Make numerical sequences, gather into groups numbers according to given or self-dependently set rule. Compare and put in order numbers according various signs: mass, volume, time, price. Take out signs of objects, find objects according to given signs.

Compare two or more objects and outline various signs. Divide objects into group according to given signs. Define common signs of objects from one category (group of similar objects) and meaning of signs of various objects of this category. Fill in the table of signs for objects of one category (in every segment of table there is written meaning of one or several signs for one of few objects).

Subject: Environment.

Tasks: Find differences in objects and outline their signs. Compare and find differences in various groups of living organisms according to signs. Gather into groups according to names known wild and cultivated plants, wild and domestic animals.

Subject: Native language.

Task: Gather into groups words according to thematic sign (words that mean transport, clothing, tableware, furniture, domestic and wild animals and so on). Arrange in alphabetical order lists (pupils, words, names of books and their authors). Use knowledge of alphabet when applying to catalogues, reference books, dictionaries.

5. Ability to structure materials.

Subject: Mathematics.

Tasks: Reveal structure of task. Define constituting parts of the whole, and also the internal content of these constituents and so on. Build one or two level schemes. Describe the position of one object with help of other objects enumeration, the one that is the constituent part of the other ones (in analogy with postal address). Define actions that are related to object in its whole volume and to its constituent parts.

Subject: Literary readings.

Make plan of text: divide text into parts, name every part, take out basic word, find the main idea of text (at first with help of teacher then self-dependently). Choose book in library (according to list), explain necessity of catalogue card and explain using of catalogue. Find information corresponding to idea of the text in books, in internet.

Subject: Environment.

Tasks: Collect, generalize and represent data in table form with help of diagrams. Make self-dependent choice of appropriate type of diagrams to display information.

6. Ability to make discourse.

Subject: Mathematics.

Tasks: Consider statements. Construct complex statements in a way of using logical operations to more simple statements. Write conclusions in type of rules "if-then". Make short chains of rules "if-then" in given situation.

Subject: Native language.

Tasks: Choose language means appropriate to conditions of discussion. Use means of verbal discourse in various speech situations during monologue and dialogue. Correlate text and title. Write letters, congratulatory cards. Compose a story on the given theme or on plot pictures, do it individually, in pairs or in groups. Write response about the seen, heard or read with interpretation and summarizing

of perceived information and got impression. Write composition on given or self-dependently chosen theme with or without support of given plan.

7. Ability to prove correctness of one's ideas.

Subject: Mathematics.

Task: Show examples of right and wrong statements.

Make actions according to algorithms. Solve logical tasks. Correct tasks that have faults. Choose etalon. Find peculiarities of etalon. Compare according to etalon.

Subject: Environment.

Tasks: Carry out observation about work of mass media in our life: radio, television, press, internet. When writing the message use additional information sources: dictionaries, encyclopedias, reference books (also in digital one) and rules of work with them. Find (according to given task) needed information from lesson book and additional sources of knowledge (dictionaries, encyclopedias, reference books) and discuss obtained data. When preparing report use illustrative material.

Subject: literary reading.

Tasks: Change voice (speaking manner): its intonation, volume, tempo of verbal speech. Apply rules for speakers (correspondents). Find leading tone, semantic accent. Apply ways of preparation to verbal statement (in various speech situations).

8. Ability to represent results of one's work.

Subject: literary reading.

Tasks: Compose (verbally) text (short story, comment, discussion) taking into account specifics of listeners. Define theme of your forthcoming written statement, show project of conception, define type of statement, (text-story, text-discussion, text-description), sort out appropriate expressive means of language in accordance with type of text. Compose written text (story, comment, annotation, message).

Subject: Environment.

Tasks: Compose stories using illustration from lesson book, describe (reconstruct) the most important of studied phenomena.

Subject: Technology.

Tasks: Make (as much as possible) visual aids using paper, plasticine and other materials (models, maquettes). Compose texts and publications using computer. Make design of text. Choose print type, size, color, design of symbols. Make title, subtitle, main text. Include into text illustrations, schemes, tables. Make digital publications. Apply clickable links in publication. Apply audio, video and animation in digital publication. Prepare presentation.

Subject: Technology.

Tasks: Make pictures, appliques, stained glasses on given theme. Make graphic pictures in computer. Do main operations when drawing in graphical software.

During the experiment there was developed and introduced into school practice program of extracurricular activity of junior pupils "Teaching junior pupils to research".

This program was intended for extracurricular work with children in elementary school was intended to be used in institutions of additional education.

The purpose is transformation process in development of intellectual-creative potentiality of children personality in a way of elaboration of their research skills during their self-growth.

Tasks:

-evolve cognitive demands of junior pupils;

-teach children of elementary school special knowledge, needed for carrying self-dependent researches;

-to form and develop in children skills and abilities in learning-informational research studies;

-to form conception about research teaching as leading way of learning activity.

The main parts of program:

One of the main ways of turning pupil into subject of learning activity is one's participation in learning-research activity. On the basis of applying communicational technology the introduction of additional information integrated into content of extracurricular activity represents possibilities for organization of productive learning and research activity.

This program of learning and research activity of children included three relatively independent programs:

1. Lessons directed to formation of research skills.

During these lessons pupils mastered research skills, especially:

-to see the problem;
-to give questions;
-propose hypotheses;
-classify according to various signs;
-structure material;
-make statement;
-prove correctness of one's ideas;
-represent results of work.

2. Research practice with use informational communicational technology.

Main content of work is carrying out by pupils' mini-researches and making creative projects. This subprogram took place as leading, central one. Lessons within limits of this subprogram were organized so that the degree of pupil's self-dependence in process of learning-research work started to increase.

For applying informational technologies in process of research, there was sufficient choice of demonstrative material and computer software of learning purpose. With help teacher, pupils sorted out material, found optimal way to represent information, used computer during research.

3. Monitoring of learning and research activity.

This part of program had less volume than others. Monitoring included measures that were needed to manage the process of solving tasks in research learning (holydays, seminars, conferences, defense of research works). Every pupil knew that the results of his work are interesting to others and he would be heard by classmates. Everyone knew that he needed to master practice of presenting his own research results, to master skills in argumentation of his own statements.

Description of work organizing

For 7-8 year old children duration of work was defined as 1 hour a week at school. In the first semester this work was not carried out. So, total amount of lessons on the program for the first form children was 20 hours.

Lessons that were planned on formation of research skills started only since the second semester. By that time, children mostly became adapted to school and mastered a number of learning skills (started to read, write, count).

For 7-8 year old children research practice that applies informational and communicational technologies is not big. There are provided hours for watching educational TV shows and films such as "Galileo", "I want to know", BBC documentaries. Besides, in the program, there was given time for observations and team games of project type.

Also there was given time for 7-8 year old pupils to take part as watchers at competitions on research work defenses and creative projects of 10-11 year olds.

For 8-10 year old children duration of work was defined as 1 hour in a week at school and plus home task. In total-66 hours.

The 8 year olds were included in mini researches. Practically every pupil kept diary of researcher. By their request it was offered to work in group or in pair.

For the first time pupils presented the results of mini researches at specially organized "competition" defenses of research works. It was very important to take into account that the children due to their diverse temperaments and characters, peculiarities of cognitive development and specifics of theme would work in different rates. Therefore dates of defense were planned according to readiness of their works. Authors of the best works got prizes.

For 10-11 year olds duration of work was also defined as 1 hour in a week at school plus self-independent extracurricular work. Thus total number of lessons according to program of the fourth form was 36 hours under the guidance of teacher plus self-independent extracurricular work.

Children got experience in learning research activities, therefore carrying out research work was not difficult. Summaries of their research works were demonstrated at "defenses on nominations".

RESULTS

Constantly, during experiment, there were analyzed and summarized results of intermediate measurements in development level of research skills, that were carried out to specify purpose of pedagogical experiment. At consultations held with experiment participants there were incepted amendments in direction of their activity, content, form and methods of their work on development of research skills. This allowed to do corrections during experimental work, to define perspectives in improvement of process.

For fulfilling experimental work, there were made 3 groups of pupils: 1 control group and 2 experimental groups.

In the course of practical-experimental work, in accordance with method of component analysis, every step of component actions was fixed in component analysis chart of junior pupils learning and research activity where were shown main information about the work.

Quantitative estimation was correlated with successfulness in research skills implementation and was defined as a number of fulfilled research skills to total number of research skills needed for fulfilling of the task. Qualitative estimation was correlated with research skills mastery and was defined on criteria basis. There were outlined criteria on research skills mastery (completeness, conscientious actions, rationality in fulfilment sequence of research skills, fulfillment rates, system in applying of skills) and development levels (low, intermediate, higher intermediate, advanced) of junior pupils research skills.

There were counted pupils in control and experimental groups, that achieved low, intermediate, higher intermediate and advanced levels. Also in these groups there were done evaluation diagnostics of universal learning activities of junior pupils.

Results showed, that the level of research skills development and level of universal learning activities in control and experimental groups were different. In the experimental groups, the level of research skills and universal learning activities development increased up to higher intermediate level and in several components it reached advanced points. In the control group there were not considerable changes.

Movement to the new level (from low to intermediate, and from intermediate to higher level) according to successfulness index was revealed in 80% of pupils, and according to mastery index it was revealed in 75% of pupils in experimental groups. The indices of control group did not have considerable changes, 30% in successfulness and 32% in mastery. These results showed that organization of work on research skills development taking into account its interrelation with universal learning activities was correct.

DISCUSSIONS

By theoretical and practical studies, it is proved that elementary school pupils can master research skills, and especially through research skills there evolves thought process. These skills are conducive to self-dependent personality formation of junior pupils who are ready to create new ideas, to take non-traditional decisions, who are able to master not only experience of older generation but also enrich and develop it with their own achievements (Ribakova, Parfilova, Karimova &Karimova 2015).

In our work there were specified and founded the most significant in pedagogical relation research skills of junior pupils such as: skills to propose hypothesis, to see problem, to ask questions, to classify according various signs, to structure material, to say opinion, to prove correctness of one's ideas, represent results of one's own work. Also, there were revealed interrelations of research skills with universal learning abilities (personal, regulative, cognitive, communicative). These interrelations are conditional and defined by the fact that at the present stage, research activity skills become as a term needed for universal learning activities formation. The following links are activity interrelations that reflect development dynamics of universal learning activities in research activity of junior pupils: inter-complementary and inter-correspondent links that correct needed action content at every age period of junior pupils.

CONCLUSIONS

Before modern elementary school there stands challenge to organize teaching process in such a way that the learning would become one of the main personal necessities and would be determined by individual motives of pupils so children would be initiator of one's learning activity. This fact helps to make conclusion that innovative way in education system development has to be based on idea of pupils universal learning skills formation in learning-research activity.

So, experiment results showed that junior pupils research skills are interlinked with universal learning activities which development program was included into Russian federal state education standard of second generation. Looking from position of system-activity approach the forming stage of experiment allowed to reveal the most significant skills of junior pupils. Learning and research activity of junior pupils is directed to achieve the purpose of getting research skills as universal way to acquire knowledge about real world. In progress, they develop principles of researchers thought and there activates their individual position.

This work helps to reveal regular links between research skills and universal learning activities of pupils at elementary school, which broaden scientific conception about process content of junior pupil personality development. This study makes contribution to theory of junior pupils teaching in a way of scientifically based organization of lessons and of extracurricular learning-research activity of junior pupils.

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