Formation of pupils' research skills in informational and educational environment of elementary school

E.G.Sabirova

Kazan (Volga region) Federal University, Kazan, Russia

V.G. Zakirova

Kazan (Volga region) Federal University, Kazan, Russia

Abstract: The purpose of this study is directed to theoretical establishment and experimental verification of pedagogical conditions when forming research skills of junior pupils in informational and educational environment of elementary school.

In empirical research, there took part 270 people including 211 pupil of and 9 teachers of elementary school. It was carried out in conditions of educational process going on in the schools №81 and №32, gymnasium №37 of Kazan city in Tatarstan Republic of Russian Federation.

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

Keywords: research skills, universal learning activities, systematical activity approach in teaching, learning and research activity, organizing the learning and research activity of junior pupils.

Introduction: Life in modern world demands from people taking fast and non-standard decisions, ability to adapt to new situations. Society needs a person who has independent and critical way of thinking, who can see the problem and can solve it creatively. All of these can be achieved only by giving the learner various research skills in elementary school. During this period, there goes intellectual development of children, there happen changes in main activity and there increases the need in self-expression.

Significance of research activity at school was marked by V.I.Andreev[1], I.A.Zimnaya[2], A.M.Matiushkin[3]; psychological basis in organization of learning and research activity of various age children was described by A.N.Poddyakov[5], A.I.Savenkov[4]. Theoretical, didactical and methodical bases of research activity development of pupils are shown in works of L.A.Kazantseva[6], A.V.Leontovitch[7], V.V.Repkin[8]. The problems of formation and development of pupils' research skills are analyzed in works of N.A.Semenova[9], V.P.Ushachev[10], D.K.Bamatova[11].

Modern social demands are directed то identity, cognitive and cultural development of pupils. These demands were reflected in Russian Federation state educational standards of the second generation. Besides the traditional formation of subject knowledge and skills, these standards include the program of universal learning activity development. This program represents the combination of ways which provide independent acquiring of new knowledge, forming of skills, self-development of individual in a manner of wilful taking new social experience. The development of universal learning activities that are done on the bases of systematical activity approach supposes active involvement of learners. Learning turns into cooperation – joint work of a teacher and pupils directed on getting knowledge and solving problems. Earlier V.V.Davydov[2] wrote that learning activity turned out as quasi-research.

Learning and research activity in informational and educational environment in its essence appears to be variable, because every pupil of elementary school when acquiring various informational resources keeps in mind one's own needs, interests and tendencies to solve different problems. In addition to it the activity demands the choosing of invariant – significant research skills. For a learner without these skills, it would be difficult to get self-determination and self-development, and in further perspective to achieve self-realization in society and more over to evolve the society.

The main pedagogical condition for forming research skills of pupils is the pedagogical potentiality of informational and educational environment of elementary school. It is used in organization of learning and research activity and includes the following possibilities: increasing the motivation in account of interactive character of teaching, encouraging the learning and research work of pupils, stimulating dialogical character of learning process; providing individual educational line for junior pupil, independent choice of the routine in learning and educational activity that is done on the basis of using personal computers and other informational and computer technologies; increasing the visualization of the teaching process by instruments of multimedia; using the new sources of

information (inquiry systems, electronic encyclopedia, internet sites); broadening the range of learning and research in account of considerable increase of the incoming data when observing the current processes; taking the new informational and computer technologies methods into learning and research activity of junior pupils, accepting the computer as the instrument for learning and research activity; acquiring the primary skills of modelling in a way of merging into virtual environment.

Methods: In accordance with logics of this study there were used the following methods: theoretical analysis of psychological and pedagogical, training and methodical literature, summarizing the experience of Russian and foreign specialists; pedagogical projecting and theoretical modelling; inquiry-diagnostic methods (observing, use of questionnaire, testing, conversations, individual interviews, self-estimation); experimental methods (verifying and forming pedagogical experiment, experimental work).

For diagnostics of development dynamics of junior pupils research skills there were used the following methods: method of component analysis, that lets carry out quantitative and qualitative estimation of learning results on different components of research skills; method where in accordance with the gradation scale of V.P.Bespalko[13] there was counted the number of learners in the control and experimental groups who got low, intermediate, higher intermediate and high levels (for this study it was considered sufficient the achievement of higher intermediate level); method of value relation to learning and research activity ("Pictures of objects" method by M.E.Kotova).

During the verifying experiment, there was used the method of component analysis to estimate the level of junior pupils' research skills formation. This method was described by V.I.Zagvyazinski[14]. It lets carry out quantitative and qualitative estimation of teaching results according to different actions of research skills.

Quantitative estimation is linked with the successfulness of significant research skills and it is defined as the relation of a number of realized research skills to the total number of research skills that are needed for task fulfilling.

Qualitative estimation is linked with mastering of significant research skills and defined on the basis of criterions: completeness of applied research skills, awareness and rationality in their usage, the fulfilling rate and systematic usage. The given criterions were selected and shown by methods of expert evaluations.

During the verifying experiment when comparing the results, there were not revealed significant differences between them. In the verifying experiment, there were defined problems significant for formation of research skills. According to analysis of successfulness in fulfilling research skills, the learners in all groups showed intermediate level only in ability to ask questions and to classify on various features. According to analysis of mastering the research skills the learners in all groups showed intermediate results in the fulfilling rate and in systematic usage of skills. Other skills were mastered on low level. Estimation diagnostics of universal learning activities of junior pupils showed low results. This is not unexpected for the first year pupils.

The forming of research skills of pupils went on according to step-by-step work. That was one more pedagogical condition. The first stage –adaptation (1st year), in this period there prevails instructive-seeking, learning and informational activity of pupils; the expected results in mastering the skills: making questions, classifying, observing, doing experiments; mostly there are used the following methods: informational and developing, problem solving, algorithmic; at this stage in learning and research activity there are applied frontal, grouped forms of work; the means of achieving the given tasks is the solving of the initial project tasks at the lessons ("Gather portfolio", "Guests of the lesson", "Travelling to a planet" and so on.), tasks based on algorithmic instruction, tests. There are taken out the most effective for this stage forms and means of extracurricular activity: observations, collective games of project type: "machine of imagination", "Chip for a man", "Telepathic transmission of information" and so on., fulfilling the tasks with the use of computer simulators, computer labyrinths, calculating and playing algorithmic mediums, watching intellectual TV shows and so on.

Second stage – mastering (2-3rd year), at this period there prevails partial-seeking learning and informational activity of pupils; planned results on mastering of skills: saying ones' own opinion,

defining own position, seeing the problem, bringing up a hypothesis, formulating the definitions to notion; mostly there are used the following methods: productive, heuristic, programmed; there is used work in groups, work in pairs; the means of achieving the given tasks are: solving the system of particular project tasks at the lessons ("Around the world", "Mathematic secrets", "Riddles of words" and so on), doing reports, abstracts, solving the tasks of dynamic character and of creative tasks by pupils. As the most effective form and means of extracurricular activity for this stage there were defined: participation at school contests, learning seminars, grouped mini-researches: "Deciphering of codes", "Pyramid", "Constructor", "Medley" and so on., doing the tasks with the use of: computer encyclopedia, computer lesson books, and inquiry systems.

Third stage – self-realization (4th year), at this stage there prevails research learning and informational activity of pupils; planned results on mastering the skills: ability to construct the learning material, explain, prove and defend ones' own ideas, prepare texts of reports, presentations, portfolio; mostly there are used research methods; applied work in pairs, individual forms of work; the means of achieving the given tasks are: solving of concluding interdisciplinary project tasks at the lessons ("Build a house", "Make a comics" and so on.), project work, making presentations, computer portfolio. As the priority forms and means of extracurricular activity for this stage there come forward: self-dependent research (possible directions for the choice of themes in learning researches: living and inanimate nature, culture, art, technics, activities of people), participation in scientific conferences for pupils, studying the programs for making of informational products, reflection.

The results of records taken to find out the formed level of research skills of pupils in the control and experimental groups let with more degree of reliability say that the pupils of experimental groups have their research skills in more sufficient level and in several components it reached higher level. In the control group, there were not found noticeable changes.

There is clearly seen the transition to a new positive level (from low to intermediate and from intermediate to higher level) for 80% of pupils in experimental groups according to index of successfulness, and for 70% of children in experimental groups according to index of mastering. The control groups have comparatively lower results: 30% and 32% accordingly.

Conclusions: The curried out study led to following results. Revealing and realization of pedagogical potentiality of the elementary school informational and educational environment influences on forming of research skills of children. The forming of research skills of junior pupils is provided by consecutive transition from instructive-seeking, learning and informational activity (adaptation stage) through partial-seeking, learning and informational activity (mastering stage) to research learning and informational activity (self-realization stage).

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