

## Development of Project Abilities in Primary School Students

Natalya N. Kalatskaya<sup>a</sup> and Albina R. Drozdikova-Zaripova<sup>a</sup>

<sup>a</sup>Kazan (Volga region) Federal University, Kazan, RUSSIA

### ABSTRACT

Increasing need of the society in people capable to treat any changes creatively and to solve existing problems unconventionally and qualitatively proves the relevance of the paper. Among professional competences the teacher is supposed to master, there has appeared a requirement to develop school students' project abilities: to single out a problem, to find the way to solve it, to set a goal, to plan the course of its achievement, to analyze obtained result in compliance with the objective and way of its achievement, to see a new problem etc. In this regard, the paper is focused on the formation of project abilities in primary school students. The leading methods to the research of this problem are the following: theoretical - study and analysis of pedagogical, psychological and methodical literature on the research problem; empirical - testing, questioning, pedagogical experiment; methods of research results processing (qualitative and quantitative analysis). The paper covers experimental research results on the implementation of the developing program "We Project. We Create. We Study"; positive dynamics in formation of school students' project abilities has been achieved. Materials from the paper are of practical value for primary school teachers, psychologists and parents of younger school-age children.

### KEYWORDS

Project, project activity, project abilities, primary school student, pedagogical experiment

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## Introduction

### *Urgency of the problem*

The priority of primary general education in the modern world is focused more on the formation of all-educational abilities and skills, ways of activity and level of knowledge assimilation than on the formation of subject knowledge, abilities and skills. Primary education is urged to solve the main task – to lay

**CORRESPONDENCE** Natalya N.Kalatskaya ✉ kalazkay@mail.ru

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the foundation of child's educational activity development: system of educational and informative motives; abilities to accept, keep and realize educational goals; to plan, control and evaluate educational actions and their result. The importance of this matter is confirmed by the fact that project activity is obligatory for primary school students according to standards of the general educational program of primary general education in Russian schools at present.

The concept "project activity" employed in modern terminology in the field of pedagogy and psychology has come into use quite recently. Basics of the project method make the content of this concept. The origin of a project method dates back to the second half of the 19th century, USA. It was called the method of problems and was associated with ideas of humanistic direction in philosophy and education developed by the American philosopher and educational reformer J. Dewey (1919). According to J. Dewey (1919) the child has to acquire experience and knowledge while researching problem and training environment, producing various models and schemes, experimenting and finding answers to controversial issues and, in general, to ascend from the particular to the general. The undoubted value of the project method is in a problem statement of material, child's active and independent position, relationships education with life, game and labour. However, the role of the inductive method of knowledge should not be overestimated. It is known that only formal actions alone without understanding the content of activity may be built on the basis of knowledge and concepts obtained by means of empirical generalization.

The method of projects is developed in more detail in works of a successor and pupil of John Dewey, a professor of pedagogy of the Teacher's training college at Columbia University William Heard Kilpatrick. He proposed to build training process on the basis of expansion and enrichment of learner's individual experience; topics should be taken from surrounding reality. According to Kilpatrick, the project may involve staging of a play in the school theater, discussion of a story or a picture, mastering some activity, for example, cooking cocoa for school canteen, i.e. everything that involves child's momentary interest. However, today it is already clear that without school curriculum, without structuring studied material and consideration of school students' age peculiarities it is impossible to arrange an effective training process.

Basic principles of project training in Russia were developed under the leadership of S.T. Shatsky (1921) since 1905. Personal interest of the trainee was a necessary condition for successful work. In 1920 "The project method" and its variant "Dalton-plan" were introduced at schools in Russia. Russian teachers considered that it helps to develop children's creative initiative. Some active supporters of the project method proclaimed it the only correct method of teaching at school. They thought that school of study, thus, turns into school of life. School students were recommended to realize the following projects: "Let's help to eliminate illiteracy", "Let's learn to breed hens" etc.

In 1931 the project method was forbidden by the resolution of the CC of the All-Union Communist Party of Bolsheviks "About elementary and secondary school". This solution was proved by the fact that due to universalization of the project method the level of school students' general education sharply decreased; the subject system of teaching and classroom system of training were proclaimed as the only true.

Modern researchers of pedagogy history point out that application of the project method at school in the 1920s really led to inadmissible falling of teaching quality. The following reasons of this phenomenon are specified: lack of prepared pedagogical staff capable to work with projects; poor development of project method techniques; hypertrophy of "the project method" at the expense of other training methods.

Now two meanings of the word "project" are available: 1) a project – as a result of project activity; 2) a project – as a form of people's joint activity arrangement. Hereinafter we will rely on both meanings.

N.Yu. Pakhomova (2005) defines: "The method of educational project is one of personally focused technologies, the way of school students' independent activity organization directed to the solution of tasks of an educational project integrating in itself a problematic approach, group methods, reflexive, presentational, research, search and other techniques".

I.P. Tarasova (2004) comes to the similar structure in her research of educational project concept: "Project" it is five "P": problem – projecting (planning) – provision of information – product – presentation. The sixth "P" is its portfolio, i.e. the folder in which all working materials, including draft copies, diaries, plans, reports, etc." are collected.

Each stage of project activity means development of these or those project abilities. Project abilities are important indicators of efficiency and productivity of project activity as they promote independence, informative activity and induce school students to self-education and self-development.

In scientific literature there is no accurate definition of "project abilities", but its analysis showed that most of researchers of this problem understand abilities to implement (to project) a purposeful activity as project abilities.

In the research we will hold the opinion of D.V. Makarova (2005) who understood school students' project abilities as a sequence of practical actions for planning, organization, creation and presentation of a subjectively new product".

Specific features of project abilities are: applicability in different types of educational-cognitive and labour activity; prevalence of intellectual components thanks to which project abilities are easily transferred from one sphere of activity to another; variable adequacy of ways to achieve the objective in relation to changing conditions of activity.

So, according to I.S. Sergeev (2014) the following project abilities are formed in the course of project activity:

1. Reflexive abilities: ability to comprehend a task for the solution of which there is not enough knowledge; ability to answer a question: what to learn to solve the objective?

2. Search (research) abilities: -ability to generate ideas independently, i.e., to invent a way of action attracting knowledge from various areas; ability to find missing information in the information field independently; ability to request missing information from the expert (a teacher, consultant, expert); ability to find several options for the solution; ability to make hypotheses; ability to establish cause and effect relationships.

3. Skills of evaluative independence.

4. Abilities and skills to work in collaboration: ability of collective planning; ability to interact with any partner; ability of mutual aid in group to solve

common tasks; skills of business partnership communication; ability to find and correct errors in work of other group participants.

5. Communicative abilities: ability to initiate educational interaction with adults – to engage in a dialogue, to ask questions, etc.; ability to conduct discussion; ability to defend a point of view; ability to reach compromise; skills of interviewing, oral poll, etc.

6. Presentation abilities and skills: skills of monologue; ability to behave confidently during presentation; artistic abilities; ability to use various means of presentation; ability to answer unpredicted questions.

Proceeding from project activity stages, it is possible to single out basic project skills necessary for effective work on this or that project (Matyash, 2012):

- problem formulation: ability to formulate a problem after consideration of any situation or phenomenon;
- goal-setting as ability to formulate activity objective;
- planning: to plan stages, to formulate tasks and expected results, terms, performers;
- analysis of results and reflection (analysis of results' compliance with the objective; reflection of task solution results);
- presentational: ability to present and defend the project.

Proceeding from the importance of the issue, we made an attempt to develop project abilities in primary school students. Primary school age is the sensitive period for project abilities development.

### **Methodological Framework**

76 pupils aged between 9-10 years of Kazan took part in the experiment.

The research was implemented in several steps.

1. The stating stage is directed to define reference values of studied indicators. It was revealed in children at the stating stage: the level of actions formation to coordinate efforts in the course of organization and implementation of cooperation; level of research abilities development: ability to deduce consequences, to find a problem, to represent consequences of events, the level of reflexive-evaluative abilities formation.

2. The forming stage aimed to develop project abilities. Adaptation of the program "We Project. We create. We study" was realized; it is focused on project abilities formation in primary school students.

3. Control stage. Its task is to evaluate the efficiency and productivity of performed forming work.

The following diagnostic techniques were applied in the research. The technique "Mittens" (Zuckerman & Suhoverina, 2001) identifies the level of developed actions to coordinate efforts in the course of organization and implementation of collaboration (cooperation). Children are sitting in pairs, each child gets a picture of a mitten and they have to decorate them in the same way i.e. so that they make a pair. Children can think up a pattern, but, at first, they have to agree what pattern they will draw. Each pair of children receives the picture of mittens in the form of a silhouette (for the right and left hands) and identical sets of colored pencils.

“Diagnostics of Research Abilities” (Savenkova, 2004) assumes to study the level of research initiative developed in children of primary school age. This technique consists of three parts: the first part reveals the ability to deduce consequences, the second part - ability to find a problem, the third part – ability to represent consequences of events.

"Assessment of reflexive-evaluative abilities" studies the level of reflexive-evaluative abilities development. Children are asked the following questions: What helped to implement the project successfully? What did you fail to do (weaknesses)? Why? What benefits did you get while working on the project?

Results of measurements were exposed to statistical analysis to determine the level of project abilities formation in primary school students. The multifunction F-test statistic, G-sign test, Student t-criterion were used to verify the reliability of absence or availability of distinctions obtained before and after the forming stage.

## Results

### *Results of the stating research phase*

Results obtained by the technique "Mittens" (Zuckerman & Suhoverina, 2001) showed that 50% of testees had an average level of social interaction, 34,6% high and 15,4% low, respectively. Thus, the average level of social interaction is dominating in this group of testees. It testifies that school students can agree with each other or coordinate actions to achieve a common goal only partially.

There are also indicators with a low level of social interaction (15,4%) in testees' group; it means that children do not try to agree or cannot reach agreement, everyone insists on one's own idea.

Diagnostics of research abilities showed that 50% of school children had a low level of research abilities development, 35% - average, 15% - high level.

It was found out that school students were not able to isolate a problem. As the problem is an initial source to active actions in project activity, therefore, a paramount task of our lessons will be to teach pupils to single out and formulate a problem.

The questionnaire for diagnostics of reflexive-evaluative abilities showed that 61,5% of testees use short or not full answers to assess their own activity. That is, we can claim that school students experience difficulties when it comes to assess their work as they do not fully reveal the meaning of questions. Only 38,5% of testees gave full and developed answers to suggested questions defining their strong and weak points which helped or impeded them in the course of work performance.

Thus, results of project abilities development assessment at the stating stage showed that the indicator of social interaction is characterized by an average level of social interaction, research abilities are of a low level, and low results prevail on the indicator of reflexive-evaluative abilities.

### *Results of the forming research phase*

Methods and forms of work aimed to form project abilities in primary school students were approved at the forming stage. During the forming research phase we realized the program "We Project. We create. We study". The forming

stage was implemented from March to April, 2015. Lessons were conducted twice a week and lasted 45 or 60 minutes.

The first four lessons were devoted to consecutive acquaintance with the structure of project activity. So, on the first lesson school children defined the essence and value of project activity. On the second lesson they got acquainted with the concept "problem", learned to analyze and formulate a problem. During the third one, school students got acquainted with the concept "objective", learned to define and formulate the objective proceeding from a certain problem. And on the fourth lesson, they learned to define tasks in compliance with the goal. The fifth lesson was devoted to updating of last four lessons; so on the lesson school children, working in groups, defined a problem, goal and tasks proceeding from this or that problem situation. The sixth lesson was arranged in a form of a competition; children were divided into six teams. Using a method of suggestive questions, we forwarded them to the correct formulation of a problem, objective and tasks of the forthcoming project work, and then, working in team, they developed the program of the excursion and the model of the booklet. On the seventh lesson, school students got acquainted with available types of project work and learned to define a project type. On the eighth lesson they were presented methods to implement the project work. The ninth lesson was devoted to updating knowledge obtained during all conducted lessons. Pupils defined a problem, objective, tasks, project type, applied methods proceeding from a problem situation. At the final tenth lesson children presented their project works.

Leading forms and methods of project abilities formation were: competition, group, individual and frontal forms of work, explanation, discussion, suggestive questions, exercises, association. Suggestive questions help to reduce psychological inertia and order search of answers. So, thanks to this method, we made children understand new material, checked knowledge of already studied material or taught the ways of correct problem situation analysis.

The method of exercise was used to fix an ability to formulate a problem, objective, tasks, hypothesis, and to implement the plan of action.

Explanation. This method was also often used at the beginning of each lesson to acquaint children with stages and available forms of project work. Besides, on each lesson the child was given an opportunity to evaluate their work to form reflexive-evaluative abilities. For example, at the end of one of lessons, children had to estimate their personal contribution to work of group drawing one of figures on a sheet of paper: a star (if the contribution was considerable), a square (if the contribution was insignificant), or a circle (if something went wrong).

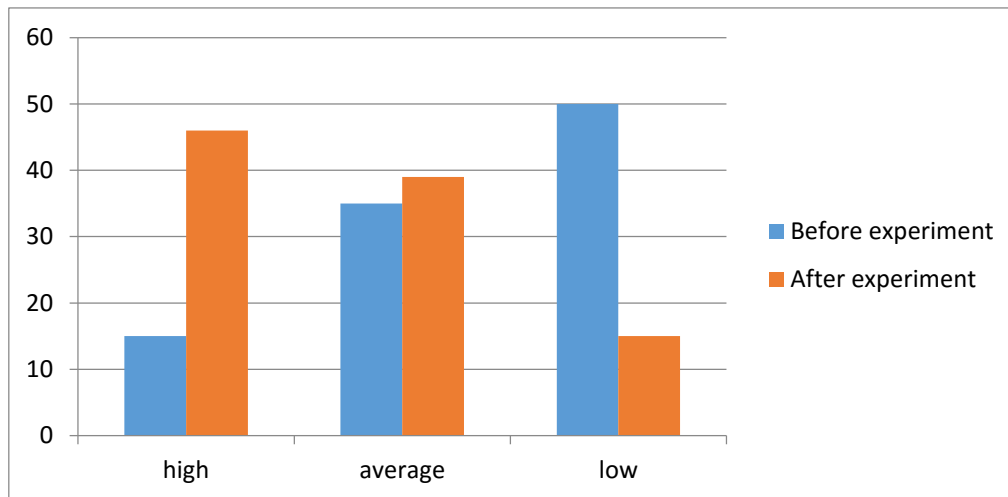
At the lesson "School excursion bureau" we organized a competition for the best excursion program in school; children were divided into six subgroups with 4-5 people in each. The goal was: to develop the draft of the excursion program around the school, to make a booklet according to requirements of the competition. Within half an hour children developed a joint project, and then each team represented their job in turn.

### ***Results of a control research phase***

During the control stage of the experiment project abilities were estimated again. The technique used at the stating stage coincided with the technique at

the control stage. A questionnaire was added to assess project abilities by school students before the experiment; the quantitative and qualitative analysis of testees' presentation abilities was conducted.

Results of "Mittens" technique showed that there were considerable changes on each level; so the result on a high level increased from 15% to 46%, on an average level from 35% to 39%, and results on a low level decreased from 50% to 15% (Figure 1).



**Figure 1.** The comparative characteristic of levels of social interaction indicator according to "Mittens" technique (Zuckerman & Suhoverina, 2001)

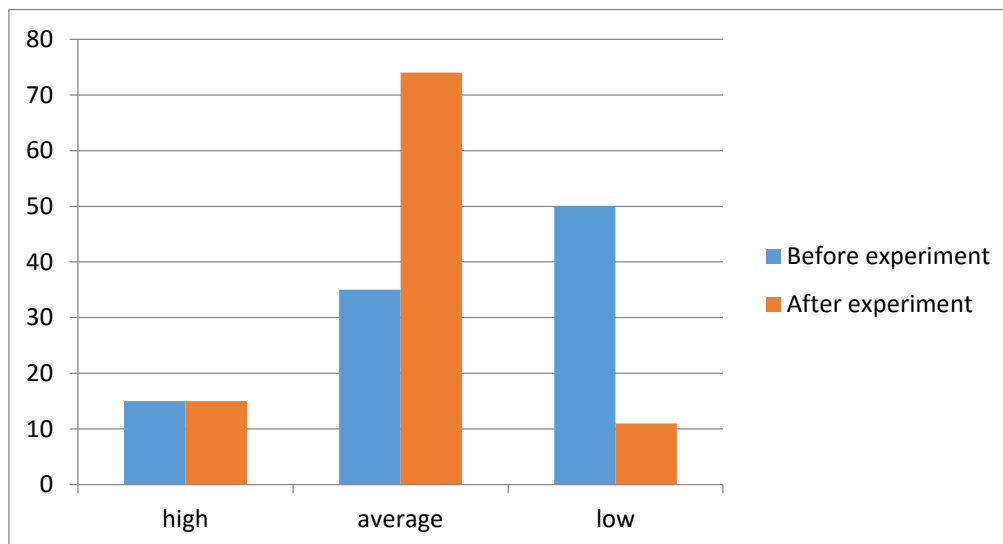
Multi-functional F-test statistic ( $t_{emp} = 3,1$ , at  $t_{cr} = 0,01$ ) was used to verify the reliability of absence or availability of distinctions obtained before and after the forming stage by the technique "Mittens" (Zuckerman & Suhoverina, 2001). Thus, the alternative hypothesis was confirmed - the level of social interaction at the stating research phase differs from the level of social interaction in primary school students at the control research phase.

Results of the control stage ("Diagnostics of research abilities" (Savenkova, 2004) showed that considerable changes happened on the second scale - an ability to find a problem. This result can be explained by the fact that on our lessons children learned to analyze a problem situation and on the basis of it to define and formulate a problem. In general, considerable changes happened on the average and low levels. If before the experiment the average level among testees made 35%, then it made 74%, besides, indicators on a low level decreased from 50% to 11% ( $t_{emp} = 9,3$ ,  $Z_1$  at  $p = 0,01$ ) (Figure 2).

Thus, pupils gained the following abilities:

- ability to generate ideas independently, i.e., to invent a way of action and to attract knowledge from various areas;
- ability to independently find missing information in an information field;
- ability to request missing information from the expert (a teacher, consultant, expert);
- ability to find several options of a solution;

- ability to make hypotheses;
- ability to establish cause and effect relationships.



**Figure 2.** The comparative characteristic of level of research abilities indicator according to "Diagnostics of research abilities"

Considerable changes occurred in reflexive-evaluative abilities. Student t-criterion for dependent samples ( $t_{exp}=4,6$  at  $p=0,001$ ) was used to verify the reliability of absence or availability of distinctions in reflexive-evaluative abilities obtained before and after the forming stage.

At the concluding lesson, to consolidate gained knowledge school students maintained their projects which they prepared independently during a month. On the basis of their presentations, the level of each speaker's presentation abilities was estimated. Presentation abilities were assessed according to the following criteria:

1. Contents of the speech

- Material is well studied and presented in a well-structured form;
- Material selection, sequence of statement and composition of the project show deep understanding of the material.
- The introduction smoothly passed into the main part of presentation speech;
- Basic provisions were clear, correlated with each other, and were stated in the form of content-rich finished statements;
- Transitions from one point to another were smooth and logical;
- The conclusion connected together the whole speech;
- The performance met time limitations.

3. Speech presentation

- Information was clearly stated;
- Statement of information was bright and memorable;



- The speaker orated enthusiastically.

On the first and second indicator - contents of the speech – the average value made 1,5 out of 2. It means that school children profoundly studied and analyzed material, and could present it in a well-structured form.

On the first indicator – presentation of the speech- the average value made 1,8 out of 2. That is, children could explain the material clearly and simply to their schoolmates.

On the second and third indicator the average value made 1,3 out of 2. It specifies that slightly more than a half of children gained the maximum two points on each indicator, and the rest received either 0 or 1. Thus, not all pupils could make transitions from one situation to another logically and smoothly. This can be connected with insufficient preparation for the project maintaining.

As for the fourth indicator, the average value made 1,6 out of 2. Most pupils could make the conclusion which united their speech.

And, finally, the average value on the last criterion made 0,8 out of 2. Most pupils could not meet time limits; that can be explained with the fact that it was first time when they maintained the project and did not pay attention to time limits; they did not work on their presentation from this point of view.

## 2. Organization of speech

- Introduction smoothly moved into the main part of speech;
- Basic provisions were clear, correlated with each other, and were stated in the form of content-rich completed statements;

The average value made 0,9 out of 2 on the first indicator - the presentation of speech. This low value can be connected with subsequent low values on two other indicators of this criterion. So on the indicator - the statement of information was bright and memorable – the average value made 0,6 out of 2, and on the third indicator - the speaker orated enthusiastically – the average value made 0,8 out of 2. And, therefore, on the first indicator – the audience was clearly presented the information - results were low as there was not enough brightness and enthusiasm in speeches.

Thus, the lowest value occurred on the criterion “the presentation of speech”. And it is not surprising; school children maintained their project works for the first time that is why they experienced nervousness, fear. We can't but consider the fact that generally children represented information type of the project, therefore, they paid more attention to facts, theoretical concepts, and as a result, from time to time, they read their material, not tell.

Also on the last lesson we proposed school children to evaluate their own knowledge of project activity before and after conducted classes (Table 1.).

Thus, positive changes which happened in the course of the forming experiment allow recognizing performed experimental work rather successful.

**Table 1.** Comparative indicators of project knowledge evaluation before and after the forming stage

Project abilities	Average value (from 3) (before lessons)	Average value (from 3) (after lessons)
1. To formulate a problem	1,8	2,7
2. To set the objective	1,8	2,6
3. To set tasks	1,8	2,5
4. To choose methods and ways to solve tasks	1,3	2,6
5. To plan work	1,9	2,4
6. To organize work of group	1,8	2,5
7. To participate in joint activity: to listen to opinion of others; to express the opinion, prove it, defend it; accept another point of view, etc.	2,1	2,5
8. To choose the type of the final project product	1,8	2,5
9. To choose a form of final product presentation	1,6	2,4
10. To see moments which helped to execute the project successfully in the performed work	1,8	2,5
11. To find "weak" points in the project work	1,6	2,5
12. To see what implementation of the project gave me personally	1,9	2,6

## Discussions

Many scientists both in Russia and abroad address this problem. Various aspects of the matter can be found in their works. So, Z.P. Larskikh's (2016) work specifies main areas of project work in practice of modern elementary school. The author considers ways to realize project activity at lessons, out-of-class periods, and in the course of these forms integration. Project activity organization for primary school students is shown in case of "Mathematic" and "The Russian language".

The program contents "School of Russia" are analyzed in the paper; opportunities for project activities in mathematics are defined. The authors revealed possibilities of project work organization for elementary school during out-of-class period to carry out child's language identity.

Main theoretical and methodical approaches to project technology in training of school students and students are considered in N.V. Matyash's works (2012), E. Baumgartnera & C.J. Zabinb (2008), S. Chu, S.K. Tse & K. Chow (2011), M. Kampourpoulou (2015), M Karpudewan, J Ponniah & A.N. Zain (2016).

Teaching opportunities of educational project and features of its implementation which will allow the teacher to understand more deeply and effectively use psychology-pedagogical factors of this method in practical work are studied by N.Yu. Pakhomova (2005). Practical and theoretical aspect of project activity is researched by M.A. Stupnitskaya (2010). She proved features of interaction with the pupil over the work on the project, determined stages and

conditions of work on the project, described a standard of work with students' age differences in view.

The work of A. Habuk & J. Nagy (2016) is of certain interest. They studied school teachers' attitude to a traditional training system and project activity. As for the teachers' role, data testify that teachers generally perceive their roles in motivation, personality formation and values transfer.

Application of the project method in training students of engineering specialties are presented in work of P.A. Sanger & J. Ziyatdinova (2014); using of the project method for children with various abilities is considered in researches of (Beneke & Michaelene, 2009).

## Conclusion

School students' project activity is one of developing (personally - focused) training methods; it aims to develop independent research abilities (such as problem statement, data collection and processing, conducting experiments, analysis of obtained results), promotes development of creative abilities and logical thinking, unites knowledge gained over educational process and acquaints school students with specific vital problems.

The project activity begins in elementary school. Of course, age peculiarities limit project activity of primary school students. Something that senior school students do easily causes difficulties in primary school students. However, school children have to be involved in project activity. Primary school is the most important and significant step in the system of school education as for the first time child's leading activity becomes educational activity. Success of study in secondary and senior school, desire and ability to perfect education throughout life depends on the way a primary school student masters educational activity.

Information and practice-focused projects were implemented in the course of program realization. Primary school students easily coped with these projects. Creative and research projects caused some difficulties. It can possibly be explained with school children age features. Further on, we will make attempts to develop teaching techniques aimed to train primary school students in these types of projects.

## Recommendations

Research work provides practical value for psychologists, heads and deputy directors of educational work at schools. It should be noted that obtained and analyzed data can be applied to primary school students in educational and upbringing process in educational institutions.

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## Disclosure statement

No potential conflict of interest was reported by the authors.

## Notes on contributors

**Natalya N. Kalatskaya** is PhD, Associate Professor of General and Social Pedagogy Department, Kazan Federal University, Russia.

**Albina R. Drozdikova** – Zaripova is PhD, Associate Professor of General and Social Pedagogy Department, Kazan Federal University, Russia.

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