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Learning Environment Affecting Primary School Student's Mental Development and Interest

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Abstract

Education is the main tool of social development, a process of systematic teaching to transfer some knowledge and skills. The choice of teaching methods influences the level of information perception by students. The article deals with the influence of studying environment on mental development level and students` interest. For cognitive development, diagnostic and academic interest to subjects testing and questioning of 736 primary school children was conducted. The respondents were divided into three groups depending on the technologies (systems) of teaching Mathematics and Russian language. The study shows that while teaching Russian using IDU technology more positive dynamics of educational effects is revealed.

Keywords: Primary school children teaching; intellectual development; academic interest in subjects; technology of integrated didactic units (IDU)

Introduction

Education and upbringing play a leading role in child's mental development (Spodek & Saracho, 2014; Galassi, 2017; Davies et al., 2016; Fauth et al., 2014; Chareka, 2010). Upbringing carries not only immediate, but also long-term consequences when it comes to personality development (Vygotsky, 1996); education can not only follow this process, but also be ahead pushing it further (Herasymenko & Sabadyr, 2016; Meyer, Kamens & Benavot, 2017).

There are two main theories regarding the problem of balance between education and development:
1. Education and development are unrelated (Piaget, 1997). This independence is expressed, in particular, in the fact that child's mind goes through all known stages, irrespective of whether a child is studying or not. According to this theory, child1s development is a result of intrinsic and spontaneous self-change, which is not affected by education.
2. Education and development are related (Tatuum & Tatuum, 2017). This theory considers development to be a dual process: maturity and education. This theory differentiates education and development, but at the same time establishes their interconnection (development prepares education, while education stimulates development).

In ontogenesis, mental development is a result of gaining social and historical experience transmitted imparted through education (Corno & Anderman, 2015). Education plays a key role in mental development, and therefore, one can control it [mental development] by changing the learning environment (Fraser, 2015). Social science and technology advance make high demands for independent, creative thinking of people. To meet them you need to improve the system of education in order to increase its influence on the development rate of pupils' thinking and their interests` development.

Mind development considers following fundamental problems of educational and age psychology:

1. Thinking is determined by studying.
2. Human thinking development in ontogenesis occurs as one stage, with known patterns of primary school students` thinking as transition from non-generic (empirical) method of solving tasks to generalized (theoretical) and further to its developed form-abstract thinking.
3. For effective theoretical thinking teaching of primary school children, special programs are needed.

When thought operates only within particular situations, it does not have sufficient control points to break up essential connections and coincidences, relations based on common homogeneous properties and associative links contiguity, common in essence and belong to the same situation (Davydov, 1996).

Operating with diverse concepts of things, phenomena, processes, child`s thinking is prepared, therefore, to realization of conception through their properties and relationship. Thus, in this stage of thinking there are prerequisites for transition to the next stage. These features are implemented in a child while, in the course of study, he masters theoretical knowledge system. The study of theoretical thinking development of primary school children can be seen with two approaches (Kalmykova, 1981).

Traditional approach: theoretical thinking development in process of knowledge system mastering. Empirical in terms of content thinking of mentioned above step can be characterized by its form as rational (in dialectical sense), distinguishing rational mental activity and actually reasonable «dialectical» idea, which involves "study of the nature of concept." Assimilating in studying process a system of theoretical knowledge,

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a child at this higher stage of developmentlearns to «investigate the nature of the concept itself», revealing through their relationship their more abstract properties; empirical in its content, rational in its form, thinking goes into theoretical thinking in abstract forms (Mikerova, 2011).

V.V. Davydov`s approach was to create special programs. Turning in the process of learning to master the system of theoretical knowledge, which is already «the study of concepts themselves» the child's thinking comes to more sophisticated understanding of his own operations laws. In this direction to seek solutions to the problem information indicating the dependence of theoretical thinking development in primary school age on the content of teaching programs was obtained. Studying using experimental programs developed by D.B. Elkonin (Elkonin, 1989) and V.V. Davydov, development is more intensive and integrated: children learn the ways of theoretical thinking in solving problems one year earlier, or in more abstract form than when studying using standard programs.

The main characteristic of integrated didactic units among modern scientific concepts is that integrated didactic units (IDU) is a didactic system of self-expansion of students' knowledge due to activation of subconscious mechanisms of accelerated information processing by means of bringing closer the interacting components of holistic idea in mental space and time.

The basic of concept`s integration was modern knowledge in epistemology (Meyer & Land, 2005; Sukhotina, 1983), principles of opposition, anticipatory reflection of reality, cyclic (reverse) connection of thoughts, combination of analysis and synthesis (induction and deduction), reliance on contrasts and analogies in thinking. Combined application of IDU methods is more efficient, compared to "excessive breakdown" of studying material, because they create conditions for displaying fundamental regularities of thinking, namely: (1) law of unity and opposition of opposites; (2) intermittent opposition of contrasting stimuli; (3) principle of reverse connections, systemic and cyclic nature of processes (Anokhin, 1998); (4) reversibility of operations (Piaget, 1997); (5) move to super symbols, i.e. usage of longer sequences of symbols (cybernetic aspect).

Enlargement of didactic units uses the hidden reserves of thinking that significantly improve the studying process efficiency in general, because human mind inherited from nervous system of evolutionary predecessors certain mechanisms of simultaneous thinking and accelerated information processing, which are subconscious. This is confirmed by the studies of scholars who considered the issues of language and speech theory.

IDU technology originates from intersection of many sciences: philosophy, logic, physiology, psychology, pedagogy, didactics, cybernetics, and computer science.

Methodological bases of these technologies consist in the fact that (1) transformation of factual information into structural information (or information of connections) occurs due to opposition of opposing and complementary concepts; (2) during knowledge assimilation a student, on the one hand, has to see and feel the objective problem, the product of solution whereof is a given task and, on the other hand, has to reproduce the "deposited" therein logic of human thought that created it; (3) substantiation of IDU technology is achieved by using paired categories of dialectics; (4) thinking is aimed at combining and identifying contradictions, which results in its solution; (5) technology uses enlarged didactic units of assimilation that contain all basic elements that form a certain holism; (6) IDU technology facilitates self-expansion of information and radically reconstructs all aspects of ordinary logic and usual thinking of a schoolchild; (7) core of studying the truth is bifurcation of entirety and understanding of opposing elements in their unity, their interconnections and transformations of one into another.

The essence of IDU technology comes down to incorporation of knowledge in space or time. Knowledge elements traditionally separated into different sections and years of study, unite and form a holistic composition of structurally new knowledge.

The analysis of IDU essence allowed formulating the definition of this studying technology: "IDU technology is a model of modern pedagogic activity that realizes substantial generalization that consists of integrative units of assimilation, which include interrelated and sometimes mutually exclusive parts and form integrity". In IDU technology definition the authors proceed from the fact that enlargement of didactic units is a variant of generalization. If educational technology already provides a substantial generalization, students will also strive to expand their knowledge, i.e. to generalize. This will develop thinking, its specific properties, and, consequently, the system of concepts, knowledge, skills and abilities, because thinking during studying by IDU technology is expanding of comprehended elements of a specific studying subject.

It is of great interest to identify the changes in development of students` thinking, which occurred with changing technology of education in primary school. In particular, there was an opportunity to compare the results of studying, designed for more or less uniform development of concrete and abstract theoretical thinking, carried out in regular school, with more intensive, in our opinion, influence which is realized in the process of studying by means of developing studying technologies by D.B. Elkonin – V.V. Davydov and IDU technology.

Z.I. Kalmikova after conducting a diagnostic experiment comparing the level of students' thinking of three groups (Group 1 – trained upon the old program – «C», Group 2 – upon the new program of mass elementary school – «H», Group 3 – Programme of V.V. Elkonin, B.V. Davydova – «E»), which aims to identify the changes in thinking development under the influence of a new studying environment, makes optimistic conclusion that these conditions have a significant impact on development of independent productive thinking of students, particularly on their verbal-logical way.

Cognitive orientation of subject interests dynamics shows a decrease from grade to grade of students' interest in Russian language (Shchukina, 1984). The reason for this phenomenon can be explained by the appearance of new subjects, which allegedly switch the attention of students to them, as well as the fact that Russian language knowledge in educational process framework of a comprehensive school is being exhausted and there is not anything new in high school. G.I. Shchukina says that, in fact, everything is much more complicated. The problem of modern school is attention to word, to its semantic meaningful basics to its communicative functions.

Objectives

The study of this aspect of the problem is to identify the influence of the learning environment on the level of mental development and interest of younger leaners.

Methods

Participants

Experimental basis of the study was secondary schools of Krasnodar, including No. 69, 67, 47, 96, 20, 37 and secondary schools of Maykop and Armavir. 736 pupils participated in the study in total. The experimental work was focused on 2-4 grade elementary school students aged 8-10. Students` selection was conducted by groups: the 1st group studied according to traditional educational system, the 2nd group studied according to D.B. Elkonin's and V.V. Davydov's developmental learning system, the 3rd group studied according to IDU technology. In addition, the authors conducted express polls of more than 1000 elementary school teachers from Krasnodar, Krasnodar Krai, Maykop, Armavir, Volgograd, Elista, and Moscow.

Measures and covariates

The methodological basis for the study served as a psychological, pedagogical researches on the development of thinking, theoretical issues of the leading role in the development of the activities of a child's personality; the concept of mental development, the activity of pupils and the development of cognitive interest in teaching pupils.

In order to achieve reliability in consideration of the problem, the following methods have been applied: theoretical analysis of psychological and pedagogical literature on the research topic; study of teaching experience; theoretical generalization, synthesis of data, questionnaires, testing.

Procedure and scientific structure

Experimental work included three stages. The first stage is preparatory stage. It includes analysis of scientific literature on pedagogy, philosophy, psychology. This analysis gives foundation for main hypotheses of study determination, level of the problem development and selection of theoretical and methodological basis of the study. It also includes the search for the conditions that affect the level of mental development and interest of junior schoolchildren. The second stage is experimental stage. It includes the plan of experimental concept, and selection and development of diagnostic methods. The stage also included the study of practical aspects of the problem, determination of conditions that facilitate effective influence of studying on the level of mental development and interest of junior schoolchildren, and determination of levels of mental development and interest in studying subjects in junior schoolchildren.

The present research used mental development method of T.A. Ratanova (Ratanova, 1995) and N.I. Chuprikova (Chuprikova, 1995), based on R. Amthauer's (Amthauer, 1953) intelligence structure test, to assess the level of intellectual development of junior schoolchildren.

The test consists of subtests, each of which is aimed at measuring different functions of intelligence. Four subtests were developed for junior schoolchildren, which include 40 verbal tasks, selected with account for programs of elementary grades. The test is provided in annex.

The first subtest consists of tasks that are a verbal variant of "find the odd one out" among five options. The data obtained from this method allow judging the mastery of generalization and abstraction, and ability of a tested to distinguish significant attributes of objects and phenomena.
The second subtest consists of tasks of conclusion by analogy. The tested has to be capable of establishing logical connections and relations between concepts.

The third subtest is aimed at finding skills of generalization (the tested has to name a concept that unites two words that are part of each task of a subtest).

The fourth subtest includes tasks that require tested to differentiate between essential attributes of objects or phenomena and inessential and secondary ones. The results of performance of certain subtest tasks allow judging the tested`s knowledge base. Each task is assigned with a score. The total result for each subtest is determined by adding scores of all ten tasks.

Assessment of students' tests

The score for each task is obtained by adding all correct answers in a given subtest. Each correct answer is worth one point. Thus, the total maximum score for all four subtests is 40 points.

Interpretation of schoolchild's results is performed as following:
40-32 points – high level of intellectual development;
31-26 points – average level;
25-20 points – insufficient (below average) level of development;
19 points or less – low level of development.

Four subtests which included 40 verbal tasks were offered to control and experimental grades.

In the first subtest, the students found the odd one out among five options. In the second subtest, the students made conclusions by analogy. In the third subtest, the students had to name a concept that united two words that were part of each task of the subtest. In the fourth subtest, the students differentiated between essential attributes of objects or phenomena or inessential and secondary ones.

The process

All 3 experimental conditions, those are, the training programs had been developed for the subject "Russian language". The teachers who worked with children on the IDU technology, had received additional training. The teachers of the other two groups confirmed their qualification using traditional teaching method and the developing method by Elkonin and Davydov.

Students testing was conducted at the end of a school year, that was, after finishing the annual program of Russian language teaching using one of the three approaches method.

The teachers survey was via email. The questionnaire consisted of 10 open-ended questions. The survey was used as an additional method to complement the data with teachers' point of view: if it is easy to teach using the technique of one of the approaches, what difficulties they met, what difficulties children met according to the teachers.

Also, the study revealed unexpected data, and as a result some specific questions about students' motivation were included in the questionnaire. A rapid survey to identify preferred subjects was conducted among all three groups students. Pooled data are presented graphically in the Figure 1.

In general, both Elkonin and Davydov's developing training and IDU technology training promote more intellectual development raising of junior schoolchildren than traditional

training. Developing training is good at the task to get middle level development but if we talk about high – IDU technology is better, and the effectiveness of the last approach is above almost two times more often, than when teaching on the system of Elkonin and Davydov.

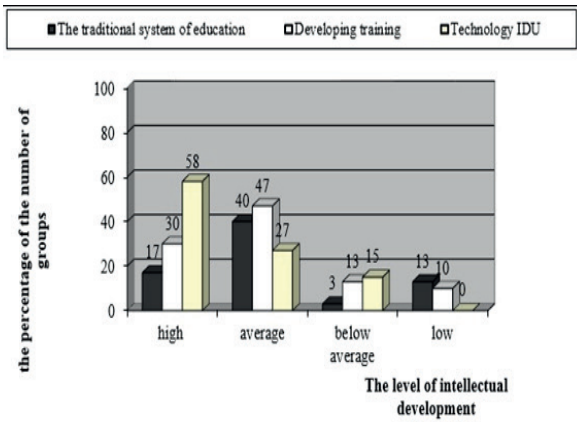

Figure1. Results of diagnostics of intellectual development level of students, depending on conditions of studying

Through the survey research of primary school teachers we found that every year at Russian lessons students learn the rules of spelling words, punctuation, but don`t work on word, on development of pupils` speech. Meanwhile, for students literature can become a school of thinking, school of creativity, school of knowledge of the most profound and subtle processes. A teacher, forming an inexhaustible interest to Russian speech, native language, remain in memory of students for a lifetime.

We also found a downward trend in interest in Russian language subject, even with primary school students. And elementary school gives foundation for future learning. Of all those surveyed, primary school teachers (sampling more than 1,000 people), only 3% of teachers notice the interest of elementary school- students in Russian language. It should be noted that this phenomenon receives a logical coloring, and of course, negative.

In the course of our research of studying using IDU technology it was determined that teaching Russian language with IDU technology increases interest in Russian language subject. Usually (what elementary school teachers confirm), students do not like school subject Russian language and prefer school subject mathematics. To determine the change in interests of primary school students in the direction of Russian language subject a questionnaire was held. Students (more than 360 students) were asked to put down their attitude in points to mathematics and Russian language school subjects (Figure 2) (Anokhin, 1998).

The third stage is conclusive one. Research materials were implemented in practical work of educational organization and educational process of Krasnodar schools.

Results and Discussion

The research showed that teaching Russian language with IDU technology junior schoolchildren was underdeveloped in modern pedagogical and methodical theory. In pedagogical theory, the author of IDU technology P.M. Erdniyev (Erdniyev, 1995) and his followers substantiated the idea of enlarging didactic units, studied didactic necessity of studying by this technology from elementary school, and suggested a methodical system of teaching mathematics and other subjects of natural sciences. Teachers are searching for possibilities of implementing IDU ideas at practical level, when teaching Russian language. However, so far, effective IDU ideas failed to become part of basis for teaching Russian language at elementary schools. This necessitated distinguishing and substantiation of bases of teaching Russian language by IDU technology at elementary schools.

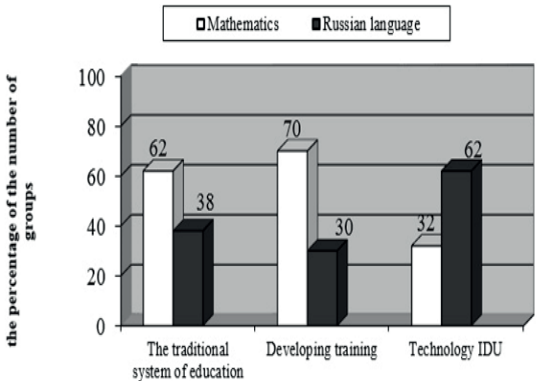

Figure 2. Results of the survey «My favorite subject»

Usage of IDU technology when teaching Russian language integrates the content of learning material that students have to master, diverse and multifaceted process of students' learning activity, and generalization among participants of studying process, in which various relationships are established.

When teaching Russian language by IDU technology, "informative weight" of each medium message (sign, symbol, word, phrase, or section) increases, because while emergence of reverse connections is simplified and, perhaps, a greater diversity of these connections is achieved (which is what occurs during the teaching by IDU technology), the overall amount of information in the system is not lost (not reduced), but is capable of accumulation (enlargement). At that, "appropriate" information becomes "cohesive" information, which transfers into long-term memory. Furthermore, additional information is extracted, because a student has to work with family of concepts and tasks, as opposed to a single exercise in ordinary studying. A student has to choose actions, signs, concepts, judgments, and trains of thought out of several possible variants. The nature of information is such that it is extracted when a person faces a choice. The more often this choice is made, the more information is extracted. Therefore, most IDU exercises are tasks with missing signs, letters, words, etc., models, matrices, certain material and ideal educational means.

Russian language classes, based on IDU technology, are knowingly based on need for enlarging knowledge, and are aimed at surrounding the main concept, at accumulating knowledge around the logical core of a lesson, at repeating the material through its development, and at transforming, which allows expanding the boundaries of Russian language studying program of elementary classes without overloading students with information.

IDU technology combines analytical process of solving ready packages with synthetic process of their compilation. Analytical processes includes analysis of word by its composition, analysis of sentence, selection of various parts of speech for models, orthographic pronunciation during writing, etc., which are combined with synthetic processes – word formation, sentence building according to schemes, proofreading during the correction of written

texts. This combines analysis and synthesis, which is a crucial feature of dialectic cognition.

Teaching Russian language by IDU technology in elementary grades ensures development and simultaneously gives junior schoolchildren knowledge, skills, and abilities.

The study allowed distinguishing junior schoolchildren with a formed mathematical, natural scientific and literature-linguistic selectivity. The study statistically proved the continuity in orientation of these students at distinguishing attributes and connections of content that they consider important and success of their processing in methods that diagnose subject selectivity of junior schoolchildren. The dynamics of selectivity in this educational and age stage was studied. The range of individual differences in nature of subject-selective activity of these pupils was found to increase from the first to the third grade. Qualitative differences in nature of subject-selective activity of junior schoolchildren with different levels of mental development were discovered. The founder of increased didactic units (IDU) technology, P.M. Erdniyev, substantiated theoretical bases of this technology from perspective of didactics and methods of teaching mathematics. His followers expanded the possibility of using IDU technology in natural sciences. In particular, they suggested methods for implementing it in teaching physics (Karyakin, 2010; Munchinova, 2013) and chemistry (Vasilyeva, 2009). There are no researches of IDU in teaching Russian language, which makes the study of bases Russian language teaching in elementary grades according to IDU technology relevant. The relevance is also determined by the need for substantiating the effectiveness of technology of Russian language teaching at elementary schools, which is aimed at developing the pupils' personality, in particular, its main component – linguistic creativity, and forming a system of linguistic concepts, knowledge, skills and abilities of junior schoolchildren.

Conclusion

These results clearly identify seen increasing interest in academic subject « Russian language» while studying on IDU technology. It is worth noting that interest in the subject during studying process plays a dual role. On the one hand, it functions as a result of studying, on the other - as an incentive to support the assimilation of subject`s content.

Thus, the article shows one of the ways of solving the problem of intellectual development level and interest in academic subjects while teaching younger students. It is based on conditions implemented in a variety of systems and technologies of teaching students - traditional system, technology of developing education of D.B. Elkonin – V.V. Davydov, technology of integrated didactic units (IDU).

Applying results of this research at practice allows forming knowledge and skills in students, developing their cognitive processes (in particular, thinking) and interest in Russian language. This will make teaching and learning more efficient, and stimulate junior's personality development. This paper will also enrich teaching methodology expert's knowledge regarding the essence and efficiency of teaching Russian language in lower grades by IDU technology.

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