The Usage Of The Innovative Pedagogical Technology In The Process Of Teaching Mathematics For Primary School Pupils

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Abstract: Nowadays teaching process in Kazakhstan is characterized by the establishment of a peculiar national model. This process is a result of following the world education paradigm and substituting the old teaching methods by an innovative teaching technology. In this case the sapid combination of the pedagogical process is the objective interaction of the main figures of teaching process, i.e. interaction of a teacher and a pupil. The innovative education paradigm emphasizes not the ability and knowledge of a pupil, but his individuality and his personal development through the acquisition of education. If a lesson is only means of organizing teaching, different innovative methods of teaching are the technologies which influence on the best results of lesson. In carrying out the innovative changes in the teaching process, the new inculcations and organizing mechanisms are involved in all objective changes. However, intensiveness in teaching is an objective energy of a maximal obtaining teaching purposes by the means of a new pedagogical idea, technology, technique and the realization of the purposes. In this case, a pedagogical innovation serves as the main means of teaching. As the pedagogical innovation is the result of interactivities that have brought changes in both upbringing and teaching systems, it can be used in all types (fields) of teaching and upbringing processes. The peculiarity of the pedagogical technology is its innovations. The main result of pupil and teacher's objective activities by using the possibilities of the pedagogical technologies is pupils' knowledge, well-upbringing and their world- outlook. The effectiveness of using many pedagogical technologies for supplying pupils' mathematical comprehension is being determined. Pupils' mathematical comprehension is closely connected with forming methodical elements. Therefore, pupil's comprehension, eagerness and enthusiasm play the main role in using the innovative technology in teaching math at primary school.
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1.Introduction

The necessity of innovating teaching methodologies and intensive development of innovative education systems by establishing regional school centers was highly emphasized in the education and professional practice part of N.A. Nazarbaev's annual message addressed to the Kazakh nation called as "Kazakhstan-2050" strategy is a new political direction of the established country", where the president of the Republic of Kazakhstan paid a particular attention to the principal program of the modern education system, of preparation and qualification of specialists [1].

The education reformation in N.A. Nazarbaev's annual message called "The strategy of enlisting Kazakhstan into 50 most competitive countries in the world" was estimated as the most important means to supply competitiveness of Kazakhstan, and the president underlined the necessity of the modern education system which meets all economic and social requirements [2].

Accordingly, by taking into account the innovative education paradigm, the effective sides of the teaching technologies must be chosen to increase the teaching effectiveness and an intensive inculcation of the best technologies in teaching process necessary for a bright future of our country and for enlisting it into the most developed countries of the world. Therefore, a creative teacher who has acquired the modern methods and innovative technologies of education is required to bring up an inquisitive pupil armed with up-to-date national education model of our country.

2. Materials and Methods

In the research the scientific works and methods of the following scientists have been widely used: Fradkin who searched the historical development of the pedagogical technologies [3], V.M. Monahov who dedicated his work to the problem of programing and inculcating the innovative teaching technologies [4], M.V. Klarin who determined the usage peculiarities of the

pedagogical technology in teaching process [5], P.K. Selevko who defined the function of the modern education technologies [6], P.M. Erdniev who made the technology of grouping didactic unites [7], T.K. Ospanov who examined the problem of using the teaching methodologies and technologies of mathematics [8], B. Baimuhanov who searched the technologies of solving mathematical problems [9] and Elubaev who offered the idea of using the old Kazakh simple arithmetical problems [10].

3. Results

The experiment was carried out according to the determining and forming stages at M. Abenova Kazakh school in Turkistan of the South Kazakhstan and at G. Muratbaev Kazakh school №240 in Zhanakorgan district of Kizilorda region. Generally, 114 pupils took part in the experiment and the exact pedagogical, psychological and methodological tasks were targeted to define at each stage.

In the first stage, the current teaching process of teaching math in school and the level and degree of the math knowledge were determined by the analyses carried out on the pedagogical, psychological and methodological literatures. Through the discussion between teachers and pupils, the levels of conducting math classes with the help of the innovative technologies were defined.

In the second stage, a new mathematic program for the primary classes was worked out with the help of forward experiences and methods on developing the importance of math course in the primary school. The methodological suggestions were made by analyzing the results of some methodological works which had been carried out.

The technology of teaching mathematics by games in the primary classes increased pupils' interest and developed their possibilities on mathematics. One of the most important tasks on pupils' game activities is to perceive the environment and to supply them with necessary things and equipment. If the methodical works with controlling group were conducted on the basis of the program, in the experimental group they were carried out on the bases of our didactic game programs.

The carried methodological experiments showed the best results on developing pupils' mathematical perception, i.e. the mathematical development exponent of the experimental group were high.

The mathematical perception models of the experimental group before the experiment were in this way:

- Number and math problem - 14 %
- Volume - 10 %
- Geometrical figure - 12 %
- Direction in the space - 12 %

In the controlling group:

- Number and math problem - 12 %
- Volume - 8 %
- Geometrical figure - 13 %
- Direction in the space - 12 %

The best results of the experimental group at the end of the experiments are explained by the effective usage of our systematic program on the didactic games. A systematic work according to the determined direction heightened the level of the pupils' mathematical knowledge of the experimental group.

Table 1. The exponent of developing mathematical perceptions in the experimental and controlling groups.

Parts of the program	Experimental group	Controlling group
Number and math problem	28 %	17 %
Volume	27 %	12 %
Geometrical figures	26 %	18 %
Direction in the space	30 %	16 %

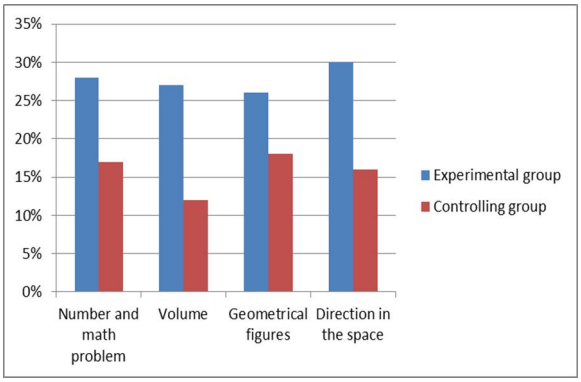

Figure 1. controlling groups

The analyses carried out for developing simple mathematical understandings of primary school pupils by using the innovative technologies enable us to come to the following conclusions:

– according to the results of the research, our system for developing pupils' mathematical knowledge meets the all requirements of "The conception of school knowledge";

– The usage of interesting game forms for the acquisition of qualified mathematical development of the school pupils fastens the process of achieving best results.

– The didactic games helped the pupils to enlarge their mathematical capabilities;

– Different cognitive games were necessary for pupils to group different things by comparing, to change geometrical figures, to reconstruct them and to describe things in different forms and volume;

– Choosing and controlling different games which influenced on developing pupils' acquisition of mathematical problems were effective: moving games, reconstructing games, writing, grouping things according to the number of them, comparing them;

– The correctness of using didactic materials for pupils' remembering numbers quickly and the evaluation of pupil's accomplishment of tasks were effective for perceiving new activities.

– In conclusion, using the innovative technologies in the process of teaching mathematics at the primary school influenced on enlarging pupils' simple mathematical understandings. To understand its essence, it is necessary for primary school teachers to acquire the innovative technologies.

4. Discussion

Innovation is a (a new method, methodology, technology, program) equipment, to innovate is the process of using this equipment [11].

A pedagogical innovation is the result of interrelations of activities which changed the teaching and upbringing systems in schools. The pedagogical innovation can be also used in all types (fields) of teaching- upbringing activities, i.e. in upbringing classes.

Shilin states that: "Technology is a life, mastery, ability, a collection of methods, a change" [12].

According to F. A. Fradkin: "Pedagogical technology is an objectivized, systematized activity of teacher and pupils who aim at certain targets" [3].

V.L. Bespalko states that: "Pedagogical technology is a certain pedagogical system and project which is accomplished in practice". He treats the pedagogical system as an interrelated methods which are specially organized for developing a personality[13].

V.M. Monahov defines that: "Pedagogical technology is a wilful model of planning, organizing and conducting the teaching process" [4].

M.V. Klarin states: "Pedagogical technology as a project of the definite pedagogical system used in practice", he defines the teaching technology as the way of constructing the professional preparation and general teaching systems. Moreover, he gives the following definition for the pedagogical technology is evaluating the methods using for conducting lesson, to prepare methods and materials for conducting lesson, to make principles and methods of education [5].

The concept of a pedagogical technology is used in the meaning of planning and constructing the teaching process, i.e., the process of making the academic plan and program, a thematic- daily plan of a subject, a plan and syllabus of a lesson can be referred to this concept. The main attention is paid on an order disposal of the teaching materials according to a teaching purpose. The pedagogical technology requires the teaching materials to be taught by dividing into definite stages and to follow the stages strictly.

PK. Selevko divides the pedagogical technology into the following groups according to their importance, usage and organization:

1) According to the level of usage (general pedagogical, object, methodological, module);

2) According to the philosophical bases (materialistic, idealistic, dialectic, metaphysical, benevolent, scientific, pragmatic and etc т.б.);

3) According to the leading factor of a psychological development (biogenesis, social genesis, psychogenesis);

4) According to scientific conception (associative- reflex, behavioristic, gestalt technology, developing);

5) According to the personal development direction (informational, actual, feeling, heuristically, applied, self- developing);

6) According to constructional and content peculiarity (educational and upbringing, general and professional directed, technocratic and humane) [6].

The development of school pupils is closely connected with the importance of acquiring and learning the innovation and with an increase of their cognitive inquisition.

Children acquire methods of explained things and activities without discovering them as new things. Due to its objectives, a new activity and a new method are certainly based on teaching, and also it is the main means of solving this problem. Through comparison pupils must find out the difference of the new task though they have never accomplished it before. Under certain case, they are able to notice any peculiarity of the new activity. The formation and development of the

psychological mechanisms which supply pupils' effective usage of methods and new themes is carried out in different pedagogical circumstances. Methods are formed in the process of working with the certain material. By the help of special exercises it is possible to develop pupils' thinking abilities of qualified usage of the methods.

The main and defining feature of children's development in the teaching process is the complexness of knowledge and activity methods. For example, if the pupils of 6-7 forms are taught to use the etalon- model to group things according to their special peculiarities, the mechanism of children's grouping operation and stages of their development will change significantly. Children are to perceive the new operations with their specific functions, i.e. the given operation must be carried out in connection with the certain activity to which the certain method is found as its main means.

The main task of teaching mathematics is not only to learn the bases of the mathematical science, also to develop intellectually, i.e. to develop their scope to adjust for and to work potentially for the society through learning the mathematics. The significant component of supplying with mathematical education at school is to enable pupils to perceive the surrounding world with the help of mathematical equipment based on the certain gained mathematical knowledge.

Mathematics is referred to subjects that cause some difficulties particularly for little pupils. Different incomprehensible information, notions, concepts, terms, signs, rules, modules are taught from the first classes. The basic reasons of pupils' weak comprehension and remembering are:

- Lack of abstractly thinking;
- Lack of comprehension of invisible relations and dependence;
- Inadequate development of remembering, attention and tendency and etc.

Up-to-date mathematical education is based on developing pupil's intellect and individual thinking. Consolidation technology of didactic units plays an important role in this field. The mathematical technology called a didactic units consolidation was invented as a result of a theoretical and practical research which was carried out by the guidance of academic P.M.Erdniev between the years 1964-1996, thus the concept "didactic units" was invented. P.M. Erdniev offers not to take away the short information given through the teaching material, but to change and to consolidate their structure, i.e. a deep comprehension, thinking and development of the material is possible through didactic unit consolidation [7].

The key of a didactic units consolidation technology is three exercises used at the same lesson: explaining the initial task of the problem, its variations and making conclusions are used during the lesson. Further, working with mathematical exercises are done through four interrelated stages: to compose mathematical exercises; to do the exercises; to check the answers; to pass to do more complicated forms of exercises. The former traditional teaching was limited with the second stage. On the basis of the units enlargement, the result of research emphasizes the necessity of composing the basic form of an exercise consisting of more compound tasks which are logically different, but are psychologically unique. For instance: a) to set a typical ready task; b) to compose a counter mathematical problem and solve it; c) to compose a task sharing the same elements with the given mathematical problem; d) to compose or solve problems sharing some parameters with the given task and devoted for consolidating materials.

The essence of the didactic units enlargement system is based on the following rule: not to revise the materials of the previous lesson, but to recompose and change the accomplished task (to change the initial form of the task). The teaching methods are brought about by doing the exercises, and the main attention is paid on the concreteness of the attained material, i.e. not the quantity of the methods, but the importance of exercises is emphasized. The exercises composed on the bases of the enlargement law provide a consciousness and substantiality of knowledge acquisition.

The textbooks "Mathematics" written by the guidance of Professor T.K. Ospanov that have been used since the year 1997 in our Republic are mainly based on this theory [8]. Therefore, all primary school teachers are still working with this method which is basically aimed at developing individuality of pupil.

The basic rules of accomplishing the methodology of the didactic units enlargement are as following:

– to teach opposite concepts and interrelated operations simultaneously;

– to work out a counter task for a direct task, to use widely solving the tasks;

– to use deformational exercises;

– to increase the quantity of tasks based on pupil's individuality and creativity.

This technology shows its effectiveness. Firstly, the teaching time is retrenched to 20%. The retrenched time is necessary to deepen the attained knowledge. Secondly, pupil's development is facilitated through thinking process. Due to

theological principle of teaching, a new relationship is formed between a teacher and a pupil.

Mathematics is a concept of modules and schemes combination about environment. The essence of mathematics is the latitude of an individual necessity, a potential and correct fulfillment of task , an ability to see the unsolved problems, the clearness of relations and notions, a concrete thinking, the latitude and flexibility of thinking, the ability to provide against the situations through the bases of making concrete analyses, the highest work capability.

To supply with a mathematical knowledge at school, to determine the importance of mathematical course, to make a standard of mathematical knowledge, an interrelationship and future of the mathematical knowledge have been widely discussed in the works of the Kazakh scientists. For example, B.Baimuhanov offers the method of supplying with the basic level of a general mathematical preparation in schools of Kazakhstan. Every pupil learning mathematics must not only get acquainted with the ready laws of the science, but also follow the practices of the scientists in the history of their emergence. B.Baimuhanov states: "to teach the history of mathematics is one of the ways of sanctifying the mathematical knowledge" [9].

According to S. Elubaev: "Mathematics serves for the conformity of intellect. One of the purposes of teaching mathematics is to teach science and to regulate thinking and to address pupils' intellectual capacities to concrete necessary things on the bases of the acquired science. However, the attainment of the target is impossible without learning mathematics" [10].

The concept of mathematical development is the result of pupil's promotion with the help of mathematical knowledge. The initial purpose of the mathematical development is to develop teaching mathematics in schools through developing pupil comprehensively.

In the process of teaching mathematics, a particular attention is paid on a systematic and intended work for developing pupils' general thinking, for enlarging their logical thinking and their understandings of space, and on developing pupils abilities to learn mathematics with a great eagerness.

The textbook of mathematics for the first form in the primary school is written in conformance with the lesson and the content of the teaching material is prepared according to the academic program. Pupils acquire scientific knowledge through working with the textbook. Basically, pupils work active with learning materials which are illustrated with pictures. The level of difficulty of teaching materials must fit pupil's age peculiarities and abilities, and teacher's opportunity to plan teaching in advance with the innovative technologies by analyzing pupils' preparations and general level of development must be taken into account.

Various exercises developing children's cognitive abilities and wittiness on the different technologies base must be inculcated to increase pupils' interest in the mathematical classes. The exercises must be set according to the degree of difficulty. Generally, a gradual complicating law is not connected with system of exercises. The gradual complicating is accomplished under the definite theme, and the inculcation of a new mathematical knowledge must be prepared from the previous material. If the mathematical conception causes difficulty to pupils, then the preparation must be increased beforehand. Pupils should be trained in solving arithmetical problems and in measuring the coefficient. The content and form of exercises should be different not to decrease pupils' interest. Non- standard and unusually formed exercises are to be worked out instead of traditional examples, tasks and typical exercises. Pupils do these exercises with a great enthusiasm. It is doubtless that the main part of the exercises, i.e. the content of teaching material is always easy for all children. However, the content of teaching material should contain materials to develop pupil's level of a mathematical preparation. It is basically closely connected with the non- standard exercises and tasks composed on the basis of the innovative technologies necessary for pupil's wittiness and reasoning. Excluding the class work exercises, teacher should have some additional exercises for homework. Marking homework exercises from textbook does not increase an academic workload, but facilitates teacher's work. Well-thought composed exercises for homework are the effective means of teaching mathematics for primary school pupils.

The pedagogical technology containing developing trend of the modern education should be used by teachers systematically in the practice, i.e. it must be implemented effectively to get a high quality education.

Upbringing of comprehensively developed personality in the modern life is not easy, it requires teachers to search and use the ennobling aspects of teaching.

So many innovative ideas were originated. One of the main important requirements to each teacher is to be able to work with the ideas of those

innovative teachers and with the innovative technologies.

The future of our independent country is the pupils sitting at the desks of schools now. To develop the types, structures of lessons and to use the innovative methods and technologies for teaching and bringing up pupils to be knowledgeable and inquisitive are the main requirements of the modern education system. Accordingly, particularly primary school teachers must implement creatively forming the mathematical understanding of primary school pupils with the help of the innovative technology. Because, up-to-date teacher should have a good command of social obligations and be brisk for innovation and being able to solve complicated pedagogical phenomena due to innovative thinking and creativity.

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