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PRACTICE-ORIENTED EDUCATION IN SCHOOL MATHEMATICS

Abstract. The article is devoted to the problems of teaching mathematics in a school with practice-oriented content. The aim of the study is to develop a methodology for teaching students to solve problems with practical content in the process of implementation of practice-oriented teaching mathematics. The development of students ' abilities to solve practice-oriented problems in the process of teaching mathematics should be considered as one of the ways of forming their mathematical competence. Practice-oriented tasks are understood as mathematical tasks, the content of which describes the situation of reality associated with the formation of practical skills of using mathematical knowledge and skills needed in everyday life.

The solution of this type of problem is largely based on the construction of a model of the real situation described in a particular problem. This model of compilation requires a high level of mathematical training and is the result of training that is appropriately called culture-universal. The constant use of practice-oriented tasks in teaching mathematics at school will allow the learner to generalize and deepen knowledge, acquire skills and knowledge on the subject, be able to link the learning process with the real conditions of life, to show initiative and independence. The researchers describe didactic goal-setting and examples of practice-oriented tasks in mathematics developed by the authors. Monitoring of learners ' activities indicates that the frequent use of practice-oriented tasks increases the interest of learners in educational activities, forms a positive motivation in the classroom

Key words: secondary school mathematics, practice-oriented tasks, motivation.

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Мектеп математикасындағы практикаға бағытталған білім

Аңдатпа. Мақала тәжірибеге бағытталған мазмұндағы мектепте математиканы оқыту мәселелеріне арналған. Зерттеудің мақсаты- тәжірибеге бағытталған математиканы жүзеге асыру үдерісінде оқушыларды практикалық мазмұндағы есептерді шығаруға үйрету әдістемесін жасау. Математиканы оқыту үдерісінде оқушылардың тәжірибеге бағытталған есептерді шығару қабілеттерін дамыту олардың математикалық құзыреттіліктерін қалыптастырудың бір әдісі ретінде қарастырылуы керек. Тәжірибеге бағытталған тапсырмалар деп мазмұнында күнделікті өмірге қажетті қоршаған айналаның шындық жағдайлары сипатталатын, математикалық білім мен дағдыларды қолдану арқылы тәжірибелік дағдыларды қалыптастырумен байланысты болатын математикалық есептер түсіндіріледі. Мәселенің бұл түрін шешу көбінесе нақты проблемада сипатталған нақты жағдайдың моделін құруға негізделген. Компиляциялаудың бұл моделі жоғары математикалық дайындықты қажет етеді және сәйкесінше жалпымәдени деп аталатын жаттығудың нәтижесі болып табылады. Мектепте математиканы оқытуда тәжірибеге бағытталған тапсырмаларды үнемі қолдану оқушыға білімді жалпылауға және тереңдетуге, тақырып бойынша білімдер мен дағдылар жинақтауға, оқу үдерісін нақты өмір жағдайымен байланыстыруға, бастамашылық пен тәуелсіздік көрсетуге мүмкіндік береді. Мақалада дидактикалық мақсат қою және авторлар жасаған математикадағы практикаға бағытталған тапсырмалардың мысалдары сипатталған. Оқушылардың іс-әрекетін мониторингілеу тәжірибеге бағытталған тапсырмаларды жиі қолдану оқушылардың оқу іс-әрекетіне деген қызығушылығын арттыратынын, сабақта жағымды мотивация қалыптастыратынын көрсетеді.

Түйін сөздер: орта мектеп математикасы, практикаға бағытталған тапсырмалар, мотивация.

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Практико-ориентированное обучение школьной математике

Абстракт. Статья посвящена проблемам преподавания математики в школе с практико-ориентированным содержанием. Цель исследования – разработка методики обучения школьников решению задач с практическим содержанием в процессе реализации практико-ориентированного обучения математике. Развитие способностей учащихся решать практико-ориентированные задачи в процессе преподавания математики следует рассматривать как один из способов формирования их математической компетенции. Под практико-ориентированными заданиями понимаются математические задачи, в содержании которых описываются ситуации окружающей действительности, связанные с формированием практических навыков использования математических знаний и навыков, необходимых в повседневной жизни. Решение проблемы такого типа в большей степени основано на построении модели реальной ситуации, описываемой в конкретной задаче. Эта модель компиляции требует высокого уровня математической подготовки и является результатом обучения, которое соответственно называют общекультурным. Постоянное использование практико-ориентированных заданий при обучении математике в школе позволит учащемуся обобщать и углублять знания, приобретать навыки и знания по предмету, уметь связывать учебный процесс с реальными условиями жизни, проявить инициативу и независимость. В статье описаны дидактическое целеполагание и примеры разработанных авторами практико-ориентированных заданий по математике. Мониторинг деятельности учащихся свидетельствует о том, что частое использование практико-ориентированных заданий усиливает интерес учащихся к учебной деятельности, формирует позитивную мотивацию в классе.

Ключевые слова: математика средней школы, практико-ориентированные задания, мотивация.

Introduction

In modern conditions, the problem of introducing a practice-oriented approach in the teaching of mathematics in secondary schools is particularly urgent, and this is a significant amount of work has been devoted to the problem (Smith 2009: 54).

For example, today everyone has to have an ability to navigate a large flow of information in connection with the rapid development of scientific knowledge. If in the past, mathematical education was focused on theoretical training, now people are required who are ready to work with large flows of information: in advanced enterprises, technological cycles become obsolete in two to three years.

A teacher today should become a designer of new pedagogical situations, new tasks aimed at using generalized methods of activity and creating students own products in the process of mastering knowledge. When organizing a training project, it is also extremely important that the training material becomes an applied material, that is, one that children deal with in everyday life. This is defining the relevance of the topic.

The purpose of the study is to develop a methodology for teaching schoolchildren to solve problems with practical content in the process of implementing a practice-oriented teaching of mathematics.

Research Objectives are:

1. To study the state of the problem under study in the scientific and methodological literature, the practice of educational institutions and determine ways to solve it.

2. To determine the role and place of practice - oriented tasks in the educational process.

3. Develop a structure for constructing mathematical problems with practical content for secondary school.

To solve the tasks, the following **research methods** were chosen: analysis of psychological, pedagogical, scientific, methodological and educational literature on the topic of research.

Literature review.

Early the authors of works (Luneeva 2017: 2825), (Llewellyn 2016: 309) and (Bushmeleva 2018: 20) have described in detail that the universality of mathematical methods in the school system allows for formal concepts of algebra, geometry and mathematical analysis at the level of scientific methodology to reflect the relationship of theoretical material of different fields of knowledge and practice. Therefore, practice-transforming activity as a manifestation of the functioning of the content of the mathematics school, determines

the significance of mathematics to prepare students for further education in the process of professional development.

The study of the problems associated with the strengthening of the social function of school mathematics at upper secondary education, with the education of pupils conviction of the importance and effectiveness of the received knowledge, devoted to fundamental research of many teachers, psychologists and trainers. In particular, the role and importance of mathematics in the development of relations between objects and shaping the practice abilities of pupils are discussed by authors of works (Yılmaz 2017: 91), Merkley 2016: 18), (Baccaglini-Frank 2015: 15), (Clements 2016: 82), (Purpura 2017: 25) and other researchers. Aspects of formation at senior pupils of professional skills that are part of the educational and cognitive activity in the process of learning mathematics are discussed in studies which is resented in (Christie 2016: 429), (Beauchamp 2015: 169), (Agyei 2016: 45), (Adams 017: 165), (Golding 2017: 511) and (Little 2018: 195).

3. Materials and methods.

Analysis of work of these researchers from the position allocation means of establishing the content and methodological communication school mathematics professional education component leads to the conclusion that this communication is carried out at the expense of applied orientation. Thus the main carrier of this orientation is the practice-orienting, in other words it consists of application and practical problems. One of the solutions which in theory enlargement didactic units is a compilation of tasks.

Adding to conceptual changes in the education policy requires understanding and specification of the results of these studies from the perspective of modern trends of its modernization. In addition, the practical implementation of any innovation generates a dialectical contradiction between the current social paradigm-conditioned building process (including education) and levels of readiness subsystems of the process, ensuring its functionality. In particular, the current requirements for graduate school, is a subsystem of the educational process, based in the aspect of applied orientation not only on the general criteria for the scope and completeness of the specific skills of the previous educational paradigm, but also on the individual characteristics of the subject of preparing for the implementation of future employment.

The problem of training organization, based on practical use, is not entirely new, but nevertheless today is relevant, since modern education must orient the student to the solution of real problems, with whom he will face in practical real. The practice-oriented tasks is meaning as the material for the compilation of which is taken from the surrounding reality, and is focused on developing practical skills of students.

An important role in the training of students to use the acquired knowledge to practical purposes belong to the study of school mathematics, because the universality of mathematical methods allows you to reflect the relationship of theoretical material with the practice at the level of scientific methodology.

Practice-oriented task bears not only didactic, but also the accuracy of the described situation, and the availability of its mathematical resolution means at the school mathematics. The practice-oriented tasks important is understanding nonmathematical the situation described in its storyline. Students in this situation, do not rely only on the mathematical knowledge, but also on experience. If this understanding is absent or insufficient the student, the mathematical solution of the problem leads to difficulty.

4. Results and discussions.

The renewal of the content of secondary education in the Republic of Kazakhstan is aimed at overcoming the shortcomings of the current system of secondary education, which are obstacles to development and do not allow to reach a qualitatively new level.

New State General Compulsory Standards Education (primary, basic secondary, general secondary) and curricula in subjects are developed on the basis of integration of two approaches: value-based and system-based. A value-based approach underpins the definition of basic values, clarifying abilities important to students, defining

a list of broad-spectrum skills as outcomes at "exit" from school.

Valuable approach focuses the organization of process of education and training on formation of national identity on the basis of the consolidating national idea. Values defined as "Kazakh patriotism and civic responsibility," respect, "cooperation," work and creativity, "openness" and "education throughout life."

A systematic approach is at the heart of a value-based approach. Determination of the content of education and expected results presented in the form of a system of educational objectives, organization of the educational process, assessment of the educational achievements of students. In this approach, the main thing is not the amount of knowledge of students on individual topics, but the real results of education,

integration of knowledge, personal development of students, ability to apply the acquired knowledge to solve educational and life tasks. But this does not mean that knowledge loses relevance, as it is known that only strong academic knowledge leads to skills development and functional literacy. Knowledge is the core of learning content. On the basis of knowledge, students develop skills and skills, mental and practical actions. Knowledge is the basis of moral beliefs, aesthetic views, world view. Mathematics training is provided through the direct experience of the teacher, in which the priority of learning is directed to the process and outcome of learning, as well as to the practical orientation of tasks.

Learning the practical-oriented tasks of a mathematics course will allow students to understand and understand:

• Surrounding reality;

• Processes in different contexts

• Usefulness of acquired mathematical knowledge and skills

For their application in research and life situations;

• Skills to solve the set tasks;

• Further independent education and solution of various practical-oriented tasks, including of an applied nature.

Children can also be actively involved in the preparation of practical-oriented tasks, as they understand that they are solving a task that is of practical importance. Practice-oriented learning leads to stronger learning, as associations with specific actions and events arise. When performing homework in mathematics it is possible to involve parents, the effect of joint work is huge. Students are beginning to perceive mathematics differently.

It is undeniable that systematic work to solve practical-oriented tasks and use of various techniques provides stable results of educational activities on the subject:

– Positive dynamics of cognitive motivation level is noted;

– It is observed that students are able to see the cause of the problem in solving the problem and independently find the necessary information in various sources;

– The number of students with a sufficient level of intellectual development has increased (ability to analyze, compare, generalize, carry out analogy and classification, think logically, act according to algorithms):

– There have also been significant changes in the values of students: in relation to the content learned, in the ability and ability to mobilize knowledge in an extreme situation, in the readiness to present them for independent external evaluation.

Thus, if practical-oriented tasks are systematically used in mathematics training during two courses, taking into account their professional orientation, not only the quality of mathematical training of students, but also interest in the subject will be improved, as well as key competencies will be formed, which will be used by them in their professional activity. Learning using practice-oriented assignments also leads to stronger learning of information, as associations with specific actions and events arise.

The inclusion of practice-oriented tasks in the separate sections of school mathematics is one of the important directions in the development of a school mathematics education. Currently, the school yet continues to focus on training, letting in a person's life of learning, but whereas today, the information society asks for human learning, the ability to independently learn and ready to action and decision-making. This determines the importance of mathematics, which is defined as the formation of students' abilities to solve problems arising in the course of practical human activity.

Under the practice-oriented tasks we understand math problems in contents of which are describing the situations of the surrounding reality that associated with the formation of practical skills for the use of mathematical knowledge and skills needed in everyday life. A solution of this type of problem to a greater extent is basing on constructing a model of the real situation which is describing in a specific task. That compilation model requires a high level of mathematical training and is the result of training, which is appropriately called a general cultural. An important feature of the practice-oriented tasks are:

the significance of the result, which provides a cognitive motivation of the learner;

the condition of the problem is formulated as a story, a situation or a problem for the permissions you want to use the knowledge of the different sections of the main subject mathematics, other subjects or from life, for which no explicit indication in the text of the task;

the information and data in the task which may be represented in various forms (drawing, table, diagram, chart, graph, etc).

Types of practice-oriented tasks:

Analytical that is the definition and analysis of objectives, selection and analysis of the conditions and its solutions;

Organizational and training that is planning and organizing a practice-oriented work of individual, group, or collective to create objects.

Assessment and correction that is the formation of action evaluation and correction process and results of operations, the search for ways to improve the analysis of activities.

An important feature of task oriented practice are (Bushmeleva 2018: 20):

significance which is cognitive, professional, general cultural and is giving social of the result, that provides cognitive student motivation;

condition of the problem is formulated as a story, a situation or a problem to solve, which is necessary to use knowledge from different sections of the main subject mathematics, from another subject or from the life to which there is no clear indication in the text of the problem;

information and data in the task may be represented in various forms: drawing, table, diagram, chart, graph, etc.

indication (explicit or implicit) the application result obtained when solving the problem.

One of the characteristics of a practice-oriented tasks is their non-standard, i.e. in the structure of the problem uncertain some of its components. Another feature is the presence of different degree of rationality - is the presence of several ways of solving the problem. Also in the problem enough bulk formulation of the conditions in the presence of excess or missing data.

Education using tasks aimed at the practical application, resulting in a more lasting assimilation of information, as there are associations with specific actions and events. The peculiarity of these tasks (unusual formulation connection with life, relationships with other disciplines) cause an increased interest of students, promote the development of curiosity, creativity. Schoolchildren captures itself the quest for solving problems. They are able to develop logical and associative thinking, contributing to the development of personal qualities of the student, namely: observation, the ability to perceive and process information, the ability to draw conclusions, using imaginative and analytical thinking; the ability to apply this knowledge to the analysis of the observed processes; development of creative abilities of students; disclosure of the role of mathematics in modern civilization;

The constant use of practice-oriented tasks in teaching of mathematics at school, will allow the student to consolidate and deepen knowledge, acquire skills and knowledge on a subject matter, to be able to link the educational process with the real conditions of life, to show initiative and independence.

During his school years, each of the students, thanks to the efforts of teachers of mathematics, solve a great number of different training tasks. But one day, many of us are asking themselves the question: "Why do we spend so much time and effort to teach children their decisions?" On the one hand, the ability to solve problems is one of the main indicators of the level of development of the pupils, the depth of the development of educational material. Therefore, any "test" mathematics, any test of knowledge contains, as the main - problem solving. And this goal, with varying degrees of success achieved, and, in learning any of the programs in any educational system. The necessity of learning the challenges, there is another "side" (in addition to developing) - applied. Parties associated with the ability "to apply the acquired knowledge and skills in real life situations", "applied" orientation of education.

Didactic purpose of practice-oriented tasks:

– Consolidating and deepening of theoretical knowledge.

– Mastering the skills and knowledge on a subject matter.

– Formation of new skills.

– Approximation of the educational process to the real-life conditions.

– Study of new research methods.

– Mastery of general educational abilities and skills.

– Development of initiative and independence.

The advantage of the lesson with practice-oriented tasks is a large information content and the interpenetration of mathematics, real processes and related disciplines at all stages of the lesson.

Here are some examples used in practice-oriented tasks at different stages of the lesson:

Organizational and motivational stage. At the beginning of the lesson advantageously use such activation techniques which provide summing pupils to recognize the necessity of adopting a new material or performing a specific task.

The table shows the temperature from 1 to 4 March 2019. Find the average air temperature in these days.

March 1, 2019	+ 2 ° C
March 2, 2019	-1 ° C
March 3, 2019	+ 1 ° C
March 4, 2019	+ 3 ° C

Mathematical dictations. For mathematical dictations can use guides to local lore, history, geography, and online resources. Dictations allow

a connection with the academic subjects "History" and "Geography". These tasks help to raise the self-esteem of pupils who have difficulty in studying mathematics, but are interested in the humanities and natural sciences.

VI class. Subject: "Interest".

Task: In the "Eldorado" stores held Christmas sale of home appliances. So the old TV price was 200,000 tenge, and became a new 180,000 tenge. By what percentage has fallen product?

Stage of learning new material.

In the study of new material, the taking of the creation of the problem situation.

V class. "Signs of divisibility" theme.

Each package 3 kg of sugar. Could it be that all the bags 123 kg of sugar? 145 kg?

VI class. "Decimals" theme.

The patient is prescribed medicine which should drink 0.5 g of 3 times a day for 8 days. One pack of 10 tablets medications to 0.25 g What the smallest number of packages will be enough for the entire course of treatment?

Stage application (fixation) of the received knowledge.

VI class. "Interest" topic.

Consider a variety of tasks:

The library 12% of all books - dictionaries. How many books are in the library, if the dictionaries in it 900?

Electric wire cut from the roll, first to 30% and then another 60% of the balance. Then in the skein left 42 m wire. How many meters of wire on a reel was originally?

Output control. At this stage, using such kinds of operation as the test task and mathematical dictations. To compile the test tasks, you can use the centralized testing tasks.

The step of determining homework. Students receive practice-oriented tasks. For the development of cognitive activities was practice-oriented tasks in the lesson.

V class "Volume cuboid".

Task: Find the volume of the aquarium for the fish-shaped cuboid. To perform this task, students need to measure length, width and height of the tank. Calculated from the formula volume cuboid.

Lessons with objectives focused on the practice, contribute to a more lasting assimilation of information, as they evoke associations with specific actions and events students. A feature of these problems is an unusual formulation connection with life and other disciplines. These challenges increase the students' interest in the subject; develops their cognitive activity.

Practice-oriented tasks, emphasizing the link with the life of mathematics and other sciences are the key to success in the development of students' personality.

V class. The theme of "natural numbers"

In the school cafeteria feeds 1045 people. On each relies '15 oil per day. How many packs of butter 180 g required for 1 day?

In one bag of candy in 4 times more than in another, and all candy 950 grams How many sweets in each packet?

In a gasoline tank is less than the other, 9 times, or 960 liters. How much gasoline in each tank?

VI class. Theme: «The percentages and proportions»

Book costs 4 rubles. How much will it cost notebook after lowering prices by 20%?

In the shop brought 400 kg of apples. On the first day 15% sold, while the second 0.5 day remaining. How much is left in the apple store?

For the preparation of asphalt taken 43.06% gravel, crushed sand 40.19%, 4.78% natural sand, 7.66% of a mineral powder. How much to take each substance to cook 12 tons of asphalt?

For the preparation of cakes for every 100 grams of the test should take 30 grams of raisins. How many raisins must be taken for 1.5 kg of dough.

Family gathered 17 kg of apples. How many get fresh juice, if the juice is 80% of the weight of all the apples?

Downloads 15 kg pears. On compote we decided to spend 40% of all the pears, and the rest went to the jam. How many kilograms of sugar to buy jam if 1 kg of fresh pears need 800 grams of sugar?

For the repair of an apartment bought 23 rolls of wallpaper. How many packs of wallpaper paste to buy, if the two adhesive pack for 8 rolls?

Autumn family consumes 300 kWh / h of electricity. In winter, consumption increased by 20%, and in the spring fell by 40%. What was the power consumption?

Each component of the practice-oriented assignments subject to the fact that this task should be to organize the activities of the student, rather than playing them with information or specific actions.

Conclusion

The development of students abilities to solve practice-oriented tasks in the process of teaching mathematics should be seen as one way of shaping their mathematical competence. This approach to training allows the future graduate school to solve problems that arise in life and professional activities.

Using practice-oriented tasks in the learning process provides a number of student mastery of universal learning activities: the ability to work with information, highlight and select the important thing is to build their own solutions and to justify them to work in pairs and in groups. Monitor the activities of students indicate that the frequent use of practice-oriented tasks enhances students' interest in learning activities, the formation of positive motivation in the classroom. In the future, we set a goal to continue to work on the preparation and use of practice-oriented tasks in the classroom mathematics in primary school to ensure stable results of the study of mathematics.

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