

Scientific Herald of Uzhhorod University

Series "Physics"

Journal homepage: <https://physics.uz.ua/en>

Issue 55, 952–960

Received: 10.11.2023. Revised: 07.01.2024. Accepted: 29.02.2024



DOI: 10.54919/physics/55.2024.95hq2

Methodical conditions which are conducive to improving the education of pupils to solve their context-based mathematics task

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Abstract

Relevance. The research's relevance is due to the need to explore optimal ways to improve the education of pupils in mathematics for the formation of mathematical literacy, by independently solving text-based tasks in mathematics regardless of the orientation of their interests and the chosen specialty.

Purpose. The purpose of the article is the characterization of methodical conditions conducive to teaching pupils to solve mathematical tasks on their own.

Methodology. The methodology of the research consisted of the use of a set of theoretical methods (general scientific, specific-scientific), which allowed processing of the scientific literature, distributing the information array, studying and clarifying terms and concepts, and structuring the collected information. And empirical methods – interviews and sociological surveys with teachers and experts in the field under study. The participants in this study were 70 primary school mathematics teachers in 2-5 grades.

Results. The article analyzes the process of the collaboration between teacher and students during solving textual problems in various ways, which allows students to form not only knowledge and skills on the relevant issue, and also to develop such elements of mathematical literacy as logical thinking and form a literate mathematical language.

Conclusions. The study's applied value is that the main points, factual materials, and conclusions can be used in the school system by teachers, methodologists, and research educators to develop recommendations for improving the teaching of schoolchildren's autonomy in solving text-based problems in mathematics.

Suggested Citation:

Utepkaliyev S, Aigabyl M, Zhanuzakova Z, Akhmurzina T. Methodical conditions which are conducive to improving the education of pupils to solve their context-based mathematics task. *Sci Herald Uzhhorod Univ Ser Phys.* 2024;(55):952-960. DOI: 10.54919/physics/55.2024.95hq2



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Keywords: methodology of teaching; text-based problems; individual work; mathematical education; and methods of solving text-based problems.

Introduction

Education aimed at developing students' abilities has become an inescapable trend in world education. Creation an enabling environment to receive a quality education for all citizens of the country and, through it, their intellectual development, is a significant duty that continues to be topical but still unresolved. And it is generally known that the "learnedness" of man and the level of his intellectual development is not synonymous [1]. Improving the quality of mathematical education of students an idea occurred along with an external independent evaluation of the achievements of graduates of schools to begin to implement the test of general learning competence by introducing the solution of text-based problems with a practical focus. In school learning in mathematics classes, problem-solving takes a special place, because it forms and develops the skills and competencies necessary to achieve subject and meta-subject results. Also, the theoretical material of the topic that was studied is assimilated and consolidated. Through the varied use of problems, there is a need to pay a lot of attention to learning "problem-solving", but, nevertheless, one of the dominant methods of learning is to show how to solve different types of problems [2].

The problem of improving students' abilities to solve text-based mathematical problems has always been the most difficult. In the contemporary conditions of development of the information society, when the amount of information analyzed and assimilated by individuals has significantly increased, including students of general education schools, the need to develop conditions conducive to improving student learning to solve text-based problems. One such approach may be the proposed technology for solving text problems using standard heuristic algorithms relative to a particular category of textual mathematical problems. Note that the text mathematical problem occupies a special place in the training programs because it is the application of the mathematical knowledge earned in different life situations. Often in primary school instead of textual mathematical problems using the term "plot problem" - a mathematical problem, which describes a particular life story, namely the quantitative side of real processes, phenomena, and situations, and it is required to find the wanted value from the data in the problem of quantities and the connections between them. They act as a didactic means not only of education, and developing pupils but also of education [3]. And one of the main components of the lesson's educational aspect is mental education. It is necessary to clarify that learning to solve text-based problems is an organized interaction between teacher and pupil, the purpose of which is to form the capacity to understand and solve different types of problems.

The generalized ability to solve problems consists of knowledge about the problems, structure, process, stages of their solution, and methods of solving; and also of the ability at certain stages to implement the necessary method and technique for achieving the result. That is to say, in order to learn how to solve problems of certain types, pupils need to know about the types of problems, and

methods of solving them, and to develop the ability to identify tasks of appropriate types for using the required variant of problem-solving. If consider the problem as the goal of learning, then the students as a result of its correct solution learns the concept of the problem, structure, components, process of solving, methods of working with the text of the problem, methods of solving individual types of it, and general methods of finding solutions [4]. In the learning process, the same problem performs different functions. It depends on its role in learning. Among the problems in math, particular attention should be paid to those that provide practical exposure to teaching and using mathematical methods in the process of solving problems for educational and practical purposes [5]. It is very important to learn to apply mathematical knowledge and skills to the mastery of other subjects and to use the information received in everyday life.

The goal of the research is to substantiate methodical conditions conducive to teaching schoolchildren to solve textual problems in mathematics on their own.

Literature Review

N.B. Istomina [6] dealt with the problem of learning to solve text-based problems. The professor came to the conclusion that the question of how to teach schoolchildren to connect in a text problem between the desired and the data, and accordingly how to choose and perform arithmetic steps, to solve the problem using various methods and forms. The concept of "textual problem" was the object of the research by G.P. Bevz and V.S. Kuzmenko [7], and S.O. Skvortsova [8]. By text problem authors mean the natural language requirement to find an unknown number or a value of some quantity based on these connections between numbers. Note that S.O. Skvortsova [8] in the case of individual independent work involves solving the problem of each student separately and mentions that independent problem solving is almost always a creative process for students, so it is important that these ones, who still find it difficult to work without help, solved problems "semi-independently". The teacher A.A. Korabtseva [9] in the works makes conclusions that the methodical system of teaching schoolchildren to solve textual problems is built on a set of five interrelated components: purpose, content, methods, organizational forms, and means of teaching. The purpose of teaching in the author's methodical system is to develop the skills of younger pupils to solve textual problems, which are manifested in the ability of students to successfully solve the problem of any mathematical structure in the primary course of mathematics.

In the work of S.M. Gorsky and I.V. Parukevich [3] students are taught to solve text problems at all levels of general and secondary education. They describe the following steps of learning to solve text problems are executed in primary school: propaedeutic and solving basic problems. The next step of the problem-solving practicum involves the introduction of new types of tasks and new methods of problem-solving. Looking at international research, it can be concluded that the connection between reading and mathematics has been explored by M.K.

Lerikkanen et al. [10] at the international level in young children. The researchers conducted a long-term study of schoolchildren who had six examinations in mathematics and reading in the first and second years of primary school. The results showed that mathematics and reading understanding were strongly related during both years of study. U. Leppanen et al. [11] found that preschool children's ability to score predicted their reading skills, word chain reading, and comprehension skills in fourth grade.

It should also be mentioned that the document of the National Council of Mathematics Teachers "The Main Directions of Mathematics Curricula" defines that the solution of problems remains a key topic. Although there has recently been much literature on best practices for solving problems in math [12; 13], no current information has been found on how primary school teachers solve mathematical problems for their students. This information keeps the idea that government compulsory mathematics grades in primary school include verbal tasks that require reading rather than computational skills. In addition, there is currently little information on how teachers assess students' difficulties with textual tasks. At the same time, the theoretical analysis of scientific sources demonstrates that methodical conditions conducive to the improvement of teaching schoolchildren to independently solve textual problems in mathematics were not the subject of special scientific research, which makes the problem relevant for further research.

Materials and Methods

Substantiation of methodical conditions conducive to the improvement of the teaching of schoolchildren for the independent solution of text-based problems in mathematics is carried out based on complex theoretical and empirical research methods. To achieve the purpose of the work, such theoretical methods were used: general scientific – analysis, synthesis, comparison, generalization, and systematization – for the development of scientific literature on the problems of teaching schoolchildren to solve individually textual problems in mathematics with the distribution of a massive of information on the directions of scientific research; concrete scientific – method of terminological analysis, which allowed the study and clarification of terms and concepts ("textual task", "solution method"); system analysis, which made it possible to establish connections between the elements of improving the education of schoolchildren as a holistic phenomenon; methods of system-structural and structural-functional analysis to determine factors, functions and structural components of methodical conditions conducive to the improvement of training.

Empirical methods – discussions, and e-mails with teachers and specialists in the field under the study. Especially, the study was conducted at the Postgraduate Teacher Training Institute, where hundreds of teachers attend classes, seminars, and meetings. Questions have been developed on the attitudes and practices of primary school teachers regarding the ability of their pupils to perform verbal tasks. The study involved 70 primary school mathematics teachers in grades 2-5. It was decided to limit the study to the second to fifth grades, as the first-grade students were not often given the textual tasks to

solve, and the students above the fifth grade were enrolled in secondary schools with departmental mathematical classes. The educational levels of the teachers who participated in the study included 43 bachelor's degree teachers and 37 post-graduate or master's teachers.

The data were collected through an interview in which the interviewer completed a standard protocol. Using the interview protocol and a series of open questions allows the interviewer to obtain both quantitative and qualitative data. A teacher interview guide has been developed, consisting of a protocol of interviews and available questions that meet the study's objectives. The completed interview guide was examined by two professors in the field of education and two primary schoolteachers who did not participate in the study, who examined the guidelines and questions for clarity and completeness. Based on their feedback, all dichotomous or unclear questions were deleted or rewritten. The final version of the Interview Guide contained the protocol of 11 open questions. It should be declared that accuracy was maintained when asking questions during interviews with participants. A total of 70 primary school teachers were interviewed individually. After that, a content estimation of the transcripts of interviews with teachers was conducted to identify common features and trends. To summarize the results, a list of categorical areas related to the solution of textual problems in mathematics, which are related to the research questions:

- teachers' views on students' difficulties;
- teachers' views on the causes of students' difficulties;
- the forms of teaching in the classroom when solving text-based problems in mathematics;
- teaching methods that improve the teaching of mathematics text-based problems.

Teacher Interview Questions:

1. Describe the difficulties your students experience in solving text mathematics problems.
2. How important is the ability to solve text problems for your students?
3. How do you think is the reason for their difficulties in solving text-based problems?
4. How do you feel about learning to solve text problems?
5. How would you evaluate your success in teaching students to solve text-based problems?
6. What forms of learning do you use when learning to solve text problems?
7. Where did you learn it?
8. What methods do you teach students for solving text-based problems?
9. Where did you study them?
10. What do you consider to be the best method of teaching text-based problem-solving?
11. Has the emphasis on learning to solve text-based problems changed in the last few years? Explain what exactly.

Results

In order to verify the theoretical provisions, which are formulated as a list of categorical areas concerning the solution of textual math problems, interviews and sociological surveys of teachers and specialists in the research sphere were conducted. To determine the

indicators of the categorical areas that are interesting to us it is necessary to clarify and form the study term, namely "text-based problem". Authors note that there is still no commonly accepted interpretation of the concept of "problem". In a wider sense, a problem means some situation that requires human analysis and further solutions. The textual problem means a description of the situation in natural and mathematical language with the requirement to quantify a component of this situation (to determine the numerical amount of some quantity by the known numerical amounts of other quantities and the connections between them), either to determine the presence or absence of some connection or to find a sequence of necessary steps [13]. It is also important to add that pupils experience difficulties in solving text-based problems. The following discussion will be devoted to the study of students' complications, causes of complications, forms, and methods of teaching, which are used to solve math text problems.

The results of the interviews with teachers in grades 2-5 were tabulated and compared. Not all interview questions were presented in the tables, but only those that are directly related to the pupils' solutions to text mathematics problems. Table 1 includes an analysis of the responses of teachers to the first question of the Interview Guide on the difficulties their students experience in solving text math problems. Most teachers mentioned more than one reason for their students' difficulties. Almost half of the teachers (45%) noted that solving text problems is difficult for students because they find it difficult to perceive and comprehend the text problem. The frequent difficulties mentioned in the answers are the inability of the pupils to compose a plan to solve the problem (35%) and the lack of vocabulary (13%). In contrast to it, only one teacher indicated that calculation is a problem. This is a worrying trend, as most students have difficulty understanding rather than calculating. This leads to the conclusion that students have slightly developed logical and critical thinking.

Table 1. Pupils' difficulties noted by teachers

Difficulty	Grade 2	Grade 3	Grade 4	Grade 5	Altogether	%
Perception and comprehension	7	15	11	10	43	45
Drawing up the plan	7	9	10	7	33	35
Vocabulary	2	4	4	2	12	13
Supportive knowledge	0	0	1	2	3	3
Logic determination	0	1	0	1	2	2
Calculations	0	1	0	0	1	1

Table 2 presents an analysis of teachers' responses to question 3 of the Interview Guide, and their views on the reasons for students' difficulties in solving textual math problems. As in Table 1, most teachers mentioned more than one cause of their students' difficulties. As can be seen from Table 2, the responses that contained the causes of students' difficulties were divided into four main categories: traditional testing (29 percent), text difficulties

(24 percent), previous teachers (17 percent), and pupil factors (15 percent). Family factors (9 percent), the school curriculum (3 per cent) and teacher training (3 percent) were the least mentioned causes of pupils' difficulties. It follows that a strong generalization of problems in testing, which is created for the average student, though differentiated, does not take into account all individual features.

Table 2. Reasons for pupils' difficulties noted by teachers

The cause of difficulty	2 grade	3 grade	4 grade	5 grade	Altogether	%
Traditional testing	4	11	10	12	35	29
Text complexity	3	5	8	11	28	24
Previous teachers	2	5	5	8	20	17
Student factors	3	5	6	4	18	15
Family factors	3	3	2	3	11	9
School program	1	1	0	2	4	3
Teacher preparation	1	1	0	1	3	3

Table 3 presents an analysis of teachers' responses to their methods of education in the classroom. The analyzed data were obtained from responses to questions 4, 5, and 6 of Interview Guides on what forms of education of text-based problems teachers use in practice and what they consider to be the best. Some teachers reported several forms of classroom education. The teachers named seven of the most popular forms they use in the classroom to teach textual problem solving, with the answers slightly

varying by level of learning. The most frequently mentioned method was problem-solving (37 percent); group work (21 percent) and interactive education (19 percent) were also mentioned as classroom methods. The rest were used by teachers but to a lower extent. It should be appointed that the use of independent forms of work in mathematics classes educators teach students to develop an independent solution to problems that can later be transferred to life situations.

Table 3. Forms of teaching used by teachers

Forms of work	Grade 2	Grade 3	Grade 4	Grade 5	Altogether	%
Independent work	6	8	8	8	30	37
Group work	3	4	5	5	17	21

Interactive work	3	5	4	4	16	19
Frontal	3	3	2	2	10	13
Pair work			4	1	5	6
Collective		1	1		2	2
Situational modeling			1		1	1

An analysis of teachers' responses to question 8 of the Interview Guide on how learners are taught to solve text math problems is given in Table 4. Many teachers reported that they teach more than one student. Note that the most common method reported by teachers was the training of students in synthetic and analytical (21%). Remark that these are two separate methods, but they can be taught together, and Table 4 is presented as one because analysis

and synthesis make up one analytic-synthetic method of problem-solving. This method is used more for understanding the problem, and it is not suitable for solving complex problems with a large number of unknowns. The method is often used to solve the problem by simplifying and solving its parts. Having solved these subproblems, and after having connected to the original problem, having already received the results.

Table 4. Methods used to solve text-based problems

Strategy	Grade 2	Grade 3	Grade 4	Grade 5	Altogether	%
Synthetic-analytical	11	12	9	7	39	21
Algebraic	5	9	11	11	36	19
Arithmetic	4	10	11	10	35	19
Logical	7	10	8	6	31	17
Modeling	1	4	6	4	15	8
Practical solution	1	5	2		8	4
Tabular	1	3	2	2	8	4
Working backward		2	1	2	5	3
Combined		2	1	1	4	2
The path of trial and error	1		3		4	2
Solve from the simple		1	1		2	1

Algebraic (19%), arithmetic (19%), and logical (17%) were also the three methods learned when solving text problems in mathematics. The algebraic method is the translation of a problem's plot into a mathematical language by creating a mathematical plot model, knowing the dependencies between the variables, solving a problem within a mathematical model, interpreting the result into a plot, and formulating an answer. The arithmetic method is to reduce to one, the exclusion of the unknown, proportional division, similarity, etc. The arithmetic method among other methods of solving text problems is of great significance. This method of problem-solving develops logical thinking, flexibility, and originality, and forms the mental qualities of the pupil.

Discussion

This study was conducted to specify what conditions contribute to improving the teaching of students to solve textual problems in mathematics individually. For that, you should comprehend difficulties, as teachers believe, students are experiencing difficulties in solving text math problems, and what are the reasons for these difficulties. The study also analyzed the forms of classroom learning and the methods used to encourage students' success in solving textual problems in mathematics. The results received in response to the first question of the research, concerning teachers' views on the difficulties their students face in solving textual math problems, showed that almost half of the teachers believe that their students have difficulty reading and understanding the problems. Remark that the teachers offered this explanation for their students' difficulties: "It's reading. Just the ability to read and understand words, vocabulary, mathematical problem

terms". In contrast to it, only one teacher answered that calculation is a problem. This is consistent with students' ability to read and understand, the mathematical text of the problem is necessary before students can apply mathematical skills [14; 15]. Especially, it can be concluded that reading in math classes is a complex combination of words, numbers, letters, symbols, and sometimes graphics. D.J. Hoff [16] found that few reading students experience difficulties in math classes due to their inability to learn, limited language proficiency, or lack of direct reading skills.

The results of the analysis of difficulties in solving text-based math problems among students show that they do not like to read extremely long problems. When they don't understand the problem, they prefer to make hypotheses without having any mathematical thinking. Students lack interest in solving mathematical problems because they are too long and complicated, which does not motivate to solve them. It also confirms that the reason why students do not solve mathematical problems correctly is that they lack an understanding of the rules and decision principles. Calculation and understanding skills are also lacking. Consequently, they cannot correctly interpret the meaning of the problem's condition and do not see the small details [17; 18]. The second categorical areas concerning the solution of text problems were teachers' views on the causes of students' difficulties. It was found that the answers, which examined the causes of students' difficulties, were divided into four main areas: testing, text difficulties, previous teachers and factors related to the student. Many teachers declared that the content of the tests had changed significantly in recent years; and reported: "All math tests now involve reading". In the transcript of

the interview, these answers were found: "Previously, the perimeter in the test was a problem for measuring the area. Now it is a text problem in the test".

The second most important reason given by the teachers for the difficulties of the students was the text of the problems. The difficulties associated with the texts relate to the words and context used in problems from textbooks or other teaching materials that schoolchildren had to solve. Many teachers' responses mentioned that the problems were not real and did not relate to the experience of their students. The second aspect of the difficulty of the text was that the problems that the students had to solve were problematic and often included more than one step. Which made the tasks more difficult. In this context, it can be concluded such an explanation that students do not read the problem carefully to understand that it consists of two steps. They just do what they see first, and they don't think about what the real question is. Another frequently cited cause of students' difficulties was the teaching of previous teachers. Interviewer responses indicated that students had a weak base because previous teachers did not teach the basics properly. Teachers with long experience reported that in the fourth grade when students move to two-step tasks and simply do not understand them. What happens is what happens in the first and second grades. Students learn keywords, and then they "cling" to them. This thesis is in line with the conclusions of Y.P Xin and D. Zhang [19], which found that students often cannot transfer skills acquired in simple tasks to more complex.

It is worth noting that one of the findings of the teachers' responses to their pupils' difficulties and the reasons for these difficulties was that many of the teachers' frustrations were almost completely due to factors beyond their control (e.g., school curriculum/textbooks, previous teachers). This coincides with research by E. Bingolbali et al. [20], which shows that teachers tend to mostly associate learning difficulties with reasons related to students. Teachers do not always pay attention to pedagogical reasons in explaining these difficulties. Despite the fact that teachers pay little attention to epistemological reasons, which can sometimes hinder the education of schoolchildren, these reasons independently or sometimes with pedagogical ones, psychological and methodological can be the bases of difficulties in teaching pupils. However, it seems that teachers ignore (or perhaps even do not know) the fact, taking into account the reasons for students' mathematical difficulties.

The results of a study on the third question, which concerned what forms teachers thought they used in a classroom to teach students mathematical textual problems, showed that teachers named seven different forms, that they use in the classroom for problem-solving training, with the answers slightly changing by class. The most commonly mentioned practice was students' self-solution of text problems, which was often directed as the result of a teacher's modeling of problem-solving strategies, but the teachers did not indicate the number of examples demonstrated or the regularity of the previous simulation. Other forms reported are frontal and group forms of classroom work. The frontal work of the teacher with the class is used in acquaintance with the tasks of a certain type or kind, and after independent and group work of students on the problems. During independent work,

differentiation of learning is carried out by choosing the frequency of assistance to students or differentiation of tasks to ensure their complexity. The proposed method of teaching schoolchildren sets text tasks, this is teaching the translation of a task with natural speech into a mathematical task, by modeling a task situation.

It is worth mentioning the fact that neither group nor frontal learning can be considered new ideas when learning to solve text problems. These data indicate that most primary school teachers do not use the forms and methods that have been researched and demonstrated a positive effect. For example, a study showed the positive use of interactive means in solving problems [21; 22]. The frequent use of written work by teachers in teaching the solution of textual problems was found, which is consistent with the results of research on the use of written work by teachers of mathematics in math classes. It is important to remark that teachers in the lower and middle classes used written papers to teach to solve textual problems, and this was a frequent educational activity [23]. However, the forms of mathematics education have not changed significantly for more than two decades [24-26].

The fourth question of the study concerned specific teaching methods and strategies to improve the teaching of textual math problems that teachers teach their students. It was found that most teachers taught more than one method to students, but the most popular method noted by teachers was to teach students the synthetic analytical method. The synthetic analytical method is quite popular with teachers, as it is easy to understand and does not cause any difficulties for students [27; 28]. This method of solution comes not from the condition of the task, but from its demand, and the main issue. When solving text tasks with this method, you need to ask: "What do you need to know to answer the question of the problem?". Consequently, in order to answer the question, it is necessary to know the conditions of problems and take into account the dependencies that connect them to the desired value. The analytical method is particularly suitable for solving new problems. It is based on the learner's ability to reason and promotes the development of productive, logical, and functional thinking [29-31].

This thesis coincides with the study of D.H. Jonassen [32] on problem-solving strategies. The scientist found that synthetic and analytical methods were common in classrooms where students were successful in solving problems. It has been determined that the solution of textual problems is a complicated process of mental activity of a student, which is aimed at transforming the object described in the content of the task into the resolution of the polarity between the condition and the requirement of the task. It was found that algebraic, arithmetic, logical, and modeling methods were among the five most used methods in solving text problems [33]. It is important to cite that in the algebraic method the following skills are formed for pupils: introduction of the unknown; performance of actions of addition and subtraction of the unknown; performance of actions of multiplication and division of the unknown; recording of dependence between the quantities; solution of systems of equations and systems of inequalities; selection of values unknown by the condition of the problem; making equations with parameter by the condition of the problem, etc. [34]. The

focus of the improvement of student's individual work should be on understanding the stages of problem-solving. The complete scheme includes the following steps: explanation and understanding of the condition; composing the conditions; solution; examination; writing the answer; analysis of the problem solution [35].

It was found that a conducive condition for improving the teaching of students to unassisted solving text-based problems is an education system that makes it possible to increase the activity of pupils, diversify and enhance the quality of education [32; 36]. For instance, these are problems aimed to improve the analysis and synthesis, problems to compile a subject on the given grounds: formulating a problem according to the model; formulating a model according to the problem. Therefore, improving the education of students to independently solve text problems is a complex and long-term process that requires using of various techniques, forms, and methods. Using different methods of solving text problems, and a variety of forms of work in the classroom, help to improve the quality of successful learning of the material for schoolchildren [37]. It is also worth considering such aspects as mathematical motivation, personal predispositions, and individual differences. Studying more closely what mathematical skills are lacking, will allow for timely intervention and possibly correct the situation and prevent more serious problems in further training.

Conclusions

Through the research, it can be concluded, that conditions are conducive to improving the student's learning to solve textual problems on their own, the following: well-chosen forms of education; the presentation of material from simple to more complex; teaching relevant and effective methods for solving text-based problems. Also at the consummation of a certain topic of study, consolidating the material should be with the pupils to make a text problem on their own. Independent work of students should be

accompanied by the use of posters with reference notes, or to make tables and diagrams on already solved tasks. With the autonomous solution to textual problems, it is crucial to organize the work of students with a text task so that each student was provided with the text. The most effective will be the use of ready-made groups of tasks or pre-printed material. Let's add that students should be given the opportunity to use different problem-solving options to help them understand the solution to any text problem. Students' preferences mostly depend on what the teacher taught them in the classroom. Therefore, teachers should also be aware of which methods are appropriate for different tasks.

Undoubtedly, the role of the teacher in the correct organization of independent activities of pupils in solving problems is enormous. If the learning process is successful for different pupils on their own, they can successfully move from one type to another during the course. The effectiveness of the autonomous solution can be easily determined after the cycle has passed through certain problem types or throughout the course. Potentials for further research may include studies that raise questions about the real practices of teachers in the classroom and the extent to which they coincide with those reported by teachers. And in addition to the need for information on how teachers work in the classroom, the whole field of textual math teaching seems to be a productive ground for future research.

Acknowledgements

None.

Conflict of Interest

None.

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Методичні умови, що сприяють удосконаленню навчання учнів розв'язувати контекстні задачі з математики

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Анотація

Актуальність. Актуальність дослідження обумовлена необхідністю пошуку оптимальних шляхів удосконалення навчання учнів математики для формування математичної грамотності, шляхом самостійного розв'язування текстових задач з математики незалежно від спрямованості їх інтересів та обраної спеціальності.

Мета. Метою статті є характеристика методичних умов, що сприяють навчанню учнів самостійно розв'язувати математичні задачі.

Методика. Методологія дослідження полягала у використанні комплексу теоретичних методів (загальнонаукових, конкретно-наукових), що дозволило опрацювати наукову літературу, розподілити інформаційний масив, вивчити та уточнити терміни і поняття, структурувати зібрану інформацію. А також емпіричні методи - інтерв'ю та соціологічні опитування вчителів та експертів у досліджуваній галузі. У дослідженні взяли участь 70 вчителів математики початкової школи у 2-5 класах.

Результати. У статті проаналізовано процес співпраці вчителя та учнів під час розв'язування текстових задач різними способами, що дозволяє сформувати в учнів не тільки знання та вміння з відповідного питання, а й розвинути такі елементи математичної грамотності, як логічне мислення та сформувати грамотну математичну мову.

Висновки. Прикладне значення дослідження полягає в тому, що основні положення, фактичний матеріал і висновки можуть бути використані в системі шкільної освіти вчителями, методистами, науковцями-педагогами для розробки рекомендацій щодо вдосконалення навчання самостійності школярів у розв'язуванні текстових задач з математики.

Ключові слова: методика навчання; текстові задачі; самостійна робота; математична освіта; методика розв'язування текстових задач.