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ОҚЫТУДЫҢ ТЕОРИЯСЫ МЕН ӘДІСТЕМЕСІ

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<https://doi.org/10.48081/VLZ17525>***N. K. Akperov¹, Y. A. Tuyakov², A. K. Ardabayeva³**^{1,2,3}Abai Kazakh National Pedagogical University,

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e-mail: nurlantutor@gmail.com¹ORCID: <https://orcid.org/0000-0001-9284-0960>²ORCID: <https://orcid.org/0000-0002-4682-6778>³ORCID: <https://orcid.org/0000-0001-5364-6364>**INTEGRATING TECHNOLOGY INTO CONTEXTUAL MATHEMATICS EDUCATION TO ENHANCE FUNCTIONAL LITERACY**

This article examines the impact of contextual learning on the development of functional literacy of 5th grade students. The main purpose of the study was to identify the effectiveness of contextual tasks aimed at various spheres of life in improving the level of mathematical literacy and critical thinking among schoolchildren. The introduction of tasks related to personal, social, professional and scientific contexts has shown its high effectiveness.

When developing contextual tasks, special attention was paid to such aspects as personal, social, professional and scientific. Repeated diagnostics after the implementation of these tasks showed a significant improvement in the level of functional literacy of students. The average scores in all contexts have increased significantly, which indicates an increase in skills in budget management, planning, organizing social projects, developing business plans and conducting scientific research.

The results of the study emphasize the need to continue working in this direction, expand the range of contextual tasks and conduct regular diagnostics. The information gathered can be utilized to create fresh curricula and initiatives that will help kids' functional literacy grow. As a result, incorporating contextual assignments into the curriculum enhances learning and equips students to handle challenges that arise in the real world.

Keywords: Contextual learning, functional literacy, mathematical literacy, critical thinking, contextual tasks, learning tasks.

Introduction

Functional literacy is growing more and more significant in today's world since it encompasses the capacity to use learned information and abilities in practical contexts. This is especially important in mathematics education, where traditional teaching methods are often not effective enough to prepare students to solve practical problems. Understanding formulas and algorithms is only one aspect of functional literacy in mathematics; another is the capacity to evaluate, understand, and apply mathematical material in a variety of real-world contexts [1]. Traditional mathematics education often focuses on theoretical knowledge, leaving aside their practical application. This leads to the fact that students can successfully solve learning tasks, but have difficulty trying to use their knowledge in real situations. The lack of a practical focus makes mathematics difficult for students [2].

The PISA research aims to measure the quality of education determined by basic skills at the current stage of society's development [3]. The information and skills that students need to fully function in real life are represented by their functional literacy level, which is represented by their global competencies in reading, math, and natural science literacy [4]. A person with functional literacy, according to A.A. Leontiev, is able to use the knowledge, abilities, and skills they have consistently developed throughout their life to tackle the widest range of problems in social relationships, communication, and human activities [5].

In this sense, it is essential to use both mathematical tasks that focus on the application of subject knowledge and special tasks like practice- and education-oriented tasks that support the development of metasubject results of mathematics instruction [6]. The development of mathematical literacy as a part of functional literacy at the school level is based on these findings. Contextual functional tasks are a type of system of specific contextual tasks that have transdisciplinary, practical, and practice-oriented content [7].

We define the content of contextual tasks according to the types of activities that were studied in the PISA study under the general heading of mathematical literacy (Table 1).

Table 1 – Task performance in the contextual functional task system categorized by mathematical literacy activity types

The purpose of the activities is to complete contextual tasks using various math literacy exercises		
Formulate	To apply	Interpret
Finding out if a scenario presented in a text in a number of different formats (verbal, symbolic, or pictorial) can be represented in a mathematical language. - To define known and unknown ratios and numbers. Determine the connections and links between unknown and known quantities. Analyze and understand the situation that resulted in the problem's mathematical formulation and the approach taken to solve it.	applying mathematical principles, definitions, theorems, and attributes of objects to solve issues and bolster findings. - Creating mathematical models (equations, inequalities, and their systems) from real-world situations. Collecting the necessary information, particularly when using graphs, diagrams, and geometric models	The results and the mathematical solution are examined. An evaluation of the results in light of the provided circumstances. Interpretation (correlation) of the results based on the given circumstance and the needs. Argumentation (defense of confirmation or denial) based on the aforementioned scenario

In a contextual task, all variants of text formats can be used, in the sequence and amount that the teacher determines, depending on the situation considered in the lesson and the educational area to which the content of the task relates [8].

As noted by A. E. Abylkasymova, for the purposes of the curriculum in subjects of the natural and mathematical direction in secondary school, it is shown that in order for students to become literate citizens, it is necessary to ensure the development of the ability to perceive, understand, analyze and summarize scientific information [9]. Also in the article «Contextual mathematical tasks as a means of developing students' functional literacy in school mathematics course» A.E. Abylkasymova and N. Akperova analyze the historical evolution of advanced national systems of mathematical education from the point of view of integrating a practice-oriented contextual approach into them [10].

According to Sh. M. Shinshina, it is crucial that the substance of the tasks included in textbooks get the majority of attention in the formation and development of functional literacy.

A comparative research of curricula and textbooks with updated content was undertaken by Tulegenov Sh. B. and Isaeva Zh. K. It was found that the study assignments in textbooks only relate to specific learning goals and do not aim to develop critical skills and competences.

Materials and methods

This study aims to determine how well contextual tasks contribute to fifth-grade students' functional literacy development during math classes. In order to accomplish this goal, a variety of tools and techniques were employed, such as a comparative study of contextual tasks utilized in other nations, an assessment of students' functional literacy levels at the moment, and the creation and evaluation of contextual tasks meant to foster this literacy. Contextual tasks from educational programs and methodological resources from nations including Finland, Singapore, Canada, and Australia served as the study's foundation. These nations were chosen because of their excellent results on international functional literacy tests, such as PISA. The tasks included examples related to real life situations requiring the use of mathematical knowledge and skills. To diagnose the level of functional literacy of 5th grade students, test tasks were developed, including questions of varying complexity, aimed at testing students' ability to apply mathematical knowledge in the context of everyday life. The author's contextual tasks have also been developed, focused on specific educational goals and needs of students, taking into account the cultural and social characteristics of the region.

Results and discussion

A comparative analysis of contextual tasks used in the educational systems of Finland, Singapore, Canada and Australia has revealed several key features. In Finland, tasks are often related to everyday situations, such as family budget planning or energy consumption analysis. For example, one of the tasks asked students to calculate how much electricity a house consumes in a month. They received data on monthly electricity consumption over the past six months and had to calculate the average energy consumption, compare it with last month's consumption and identify trends. In Singapore, contextual tasks focus on the use of mathematical models to solve practical problems. One of the tasks involved analyzing traffic data in the city and developing proposals for traffic optimization. The students received data on the average speed of traffic, the number of cars on different road sections and the time of congestion. They were asked to build graphs, draw conclusions based on statistical data and propose measures to improve the traffic situation. In Canada, the emphasis is on environmental and social aspects. Tasks are often associated with the analysis of data on the state of the environment or demographic changes. For example, the task could ask students to calculate the impact of various factors on the level of river pollution by analyzing data on

emissions from factories, population and precipitation levels. Australian tasks are often associated with cultural and historical contexts [16]. For example, one of the tasks proposed to calculate the area of the territory used for various purposes in a historical settlement and compare this data with the current ones.

Next, the diagnosis of functional literacy in mathematics lessons was carried out. Fifth-grade students' functional literacy levels were evaluated to find out how well they could now apply their mathematical knowledge in real-world situations.

Test assignments were developed as part of the diagnostic procedure to see how successfully students applied their mathematical skills in real-world scenarios. The challenges were created to address a range of functional literacy topics, including problem solving in real-world scenarios, handling data, arithmetic operations, and critical thinking. The test consisted of five tasks of varying difficulty covering key aspects of mathematical literacy.

The diagnosis was carried out on a sample of 15 5th grade students. The test results are presented in the table below (Table 2):

Table 2 – Distribution of students by levels

The level of functional literacy	Scores	Number of students
Low	20-29	5
Average	30-39	7
Tall	40-50	3

The test results indicated that kids' functional literacy levels differ. 46 was the highest total score, and 21 was the lowest. The majority of students struggle with assignments that call for using their mathematical skills and critical thinking to address real-world situations. The average overall grade score was 34, which indicates the need to improve teaching methods and make more active use of contextual tasks for the development of functional literacy.

Therefore, the diagnosis validated the necessity of creating and implementing fresh instructional strategies and materials meant to help students become more functionally literate. These results became the basis for further work on the creation of contextual tasks and their testing in the educational process.

New contextual tasks covering the four primary domains of personal, social, professional, and scientific contexts have been created in order to enhance the functional literacy of fifth-grade pupils. These tasks are aimed at developing various aspects of mathematical literacy and critical thinking, which contributes to a more effective assimilation of knowledge and its application in real life.

In the tasks of the personal context, the emphasis was on the development of personal finance management, planning and decision-making skills. These tasks

should help students understand how to apply mathematical knowledge to solve everyday problems and plan personal time and budget.

A task. Students are invited to plan a family trip to the Almaty Mountains for three days. They need to choose a route, calculate the cost of transport, accommodation, food and entertainment, keeping within the budget of 150,000 tenge.

Questions:

1. If renting a car for three days costs 30,000 tenge, and gasoline costs 10,000 tenge, how much will be left for accommodation, food and entertainment?
2. If staying in a guest house costs 20,000 tenge per night, how much money can be spent on food and entertainment per day?
3. What amount can be allocated for each of the three days, if you plan to spend 30,000 tenge on food for the entire period, and the remaining money for entertainment?

Tasks in a social context are aimed at developing teamwork, planning and resource management skills in public and social projects. They help students understand how to apply mathematical knowledge to improve society and solve social problems.

A task. Students are encouraged to organize a charity marathon to raise money for a local animal shelter. They need to calculate the costs of organizing the event and provide for fees from participants.

Questions:

- 1 If equipment rental and track preparation costs 50,000 tenge, and promotional materials cost 20,000 tenge, how much money do you need to collect from participants to cover these costs and raise another 100,000 tenge for the shelter?
- 2 If participation in the marathon costs 5,000 tenge, how many participants do you need to attract in order to achieve this goal?
- 3 What additional events can be organized at the marathon to raise more money?

The tasks of the professional context focus on the development of entrepreneurial and business skills, as well as on understanding the basics of economics and finance. These tasks should help students prepare for real professional activities by applying mathematical knowledge to solve business problems.

A task. Students are encouraged to develop a business plan for a home bakery. They need to calculate the cost of equipment and ingredients, set the price for baking and plan marketing.

Questions:

- 1 If the cost of equipment is 100,000 tenge, and the cost of ingredients is 50,000 tenge, how much do you need to earn to cover these costs and make a profit of 50,000 tenge?

2 If one unit of baking is sold for 500 tenge, how many pastries do you need to sell to achieve this goal?

3 What are the marketing Can strategies be used to attract more customers and increase sales?

The tasks of the scientific context are aimed at developing research and analytical skills, the ability to work with data and conduct experiments. They help students understand how to apply mathematical and scientific knowledge to solve real scientific problems.

A project. Students are urged to look into the water quality of the nearby river. They must collect samples, evaluate the findings, and offer suggestions in order to improve the water's quality.

Questions:

1 What equipment should be purchased for water analysis if the budget is 30,000 tenge and the cost of one test kit is 5,000 tenge?

2 If you need to analyze water at 5 different points of the river, how many test kits will be required and what will be the budget balance?

3 What measures can be proposed to improve water quality based on the data obtained?

After the introduction of new contextual tasks, a re-diagnosis of the functional literacy of 5th grade students was carried out. The results of repeated diagnostics showed a significant improvement in the level of functional literacy of students.

Conclusion

The introduction of contextual tasks aimed at various aspects of life has significantly increased the level of mathematical literacy and critical thinking among students. The introduction of contextual tasks has shown its effectiveness, however, for the further development of functional literacy, it is necessary to continue working in this direction. It is recommended to expand the range of contextual tasks, include new, more complex and multi-level tasks, as well as regularly conduct diagnostics to assess student progress.

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ФУНКЦИОНАЛДЫҚ САУАТТЫЛЫҚТЫ АРТТЫРУ ҮШІН МАТЕМАТИКАНЫ КОНТЕКСТТІК ОҚЫТУ ТЕХНОЛОГИЯЛАРЫНА БІРІКТІРУ

Бұл мақалада контекстік оқытудың 5-сынып оқушыларының функционалдық сауаттылығының дамуына әсері қарастырылады. Зерттеудің негізгі мақсаты мектеп оқушыларының математикалық сауаттылығы мен сыни ойлау деңгейін арттыруда өмірдің әртүрлі салаларына бағытталған контекстік тапсырмалардың тиімділігін анықтау болды. Жеке, әлеуметтік, кәсіби және ғылыми контексттерге байланысты міндеттерді енгізу өзінің жоғары тиімділігін көрсетті.

Контекстік тапсырмаларды әзірлеу кезінде жеке, әлеуметтік, кәсіби және ғылыми аспектілерге ерекше назар аударылды. Осы тапсырмаларды орындағаннан кейін қайталама диагностика оқушылардың функционалдық сауаттылық деңгейінің едәуір жақсарғанын көрсетті. Барлық контексттегі орташа баллдар айтарлықтай өсті, бұл бюджетті басқару, жоспарлау, әлеуметтік жобаларды ұйымдастыру, бизнес-жоспарларды әзірлеу және ғылыми зерттеулер жүргізу дағдыларының артқанын көрсетеді.

Зерттеу нәтижелері осы бағыттағы жұмысты жалғастыру, контекстік тапсырмалар ауқымын кеңейту және жүйелі диагностика жүргізу қажеттілігін көрсетеді. Алынған мәліметтер

оқушылардың функционалдық сауаттылығын одан әрі дамытуға бағытталған жаңа оқу материалдары мен бағдарламаларын әзірлеу үшін пайдаланылуы мүмкін. Осылайша, оқу үдерісінде контекстік тапсырмаларды қолдану білім беру сапасын жақсартуға және студенттерді нақты өмірлік мәселелерді сәтті шешуге дайындауға ықпал етеді.

Кілтті сөздер: контекстік оқыту, функционалдық сауаттылық, математикалық сауаттылық, сыни тұрғыдан ойлау, контекстік тапсырмалар, оқу тапсырмалар.

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ИНТЕГРАЦИЯ ТЕХНОЛОГИЙ В КОНТЕКСТНОЕ ОБУЧЕНИЕ МАТЕМАТИКИ ДЛЯ ПОВЫШЕНИЯ ФУНКЦИОНАЛЬНОЙ ГРАМОТНОСТИ

В данной статье рассматривается влияние контекстного обучения на развитие функциональной грамотности учащихся 5 класса. Основной целью исследования было определение эффективности контекстных заданий, направленных на различные сферы жизни, в повышении уровня математической грамотности и критического мышления школьников. Внедрение задач, связанных с личным, социальным, профессиональным и научным контекстами, показало свою высокую эффективность.

При разработке контекстных задач особое внимание уделялось личным, социальным, профессиональным и научным аспектам. После выполнения этих заданий повторная диагностика показала значительное улучшение уровня функциональной грамотности учащихся. Средние баллы во всех контекстах значительно выросли, что свидетельствует об увеличении навыков управления бюджетом, планирования, организации социальных проектов, разработки бизнес-планов и проведения научных исследований.

Результаты исследования показывают, что работа в этом направлении должна продолжаться, а также расширяться

спектр контекстных задач и проводить системную диагностику. Полученные данные могут быть использованы для создания новых учебных материалов и программ, направленных на дальнейшее развитие функциональной грамотности учащихся. Таким образом, использование контекстных заданий в учебном процессе повышает качество образования и готовит учащихся к успешному решению реальных проблем.

Ключевые слова: контекстное обучение, функциональная грамотность, математическая грамотность, критическое мышление, контекстные задания, учебные задания.

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