Methods of improving financial literacy of students in the course of mathematics

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List of Abbreviations

TIMSS - Trends in International Mathematics and Science Study
PISA - Programme for International Student Assessment
OECD - Organisation for Economic Co-operation and Development
IEA - International Association for the Evaluation of Educational Achievement
GSS - General Secondary Schools
CG - Control Group
EG - Experimental Group
UNT - Unified National Testing

ABSTRACT

This study aims to evaluate the effectiveness of methods for enhancing financial literacy within the context of mathematics education. Eighth-grade students was introduced to word problems with financial content, enabling the analysis of the impact on their mathematical reasoning and financial thinking skills. Participants was divided into two groups: the control group received traditional instruction, while the experimental group was taught using integrated financial problems. The findings indicated that applying real-life financial contexts positively influenced students' interest in mathematics and their attitudes toward the subject. Another point is that students demonstrated improved practical problem - solving abilities and a higher level of financial awareness. These outcomes support an importance of systematically incorporating financial literacy elements into the school math curriculum.

Keywords: financial literacy, mathematical thinking, integrated instruction, functional literacy.

АҢДАТПА

Бұл зерттеу жұмысы математика пәні аясында қаржылық сауаттылықты дамыту әдістерінің тиімділігін бағалауға бағытталды. Зерттеу барысында 8-сынып оқушыларына қаржылық мазмұндағы есептер ұсынылып, олардың математикалық және қаржылық ойлау қабілеттеріне әсері талданды. Қатысушылар екі топқа бөлінді: бақылау тобында оқушылар дәстүрлі әдіспен оқытылды, ал эксперименттік топта қаржылық есептер интеграцияланған оқыту әдісі қолданылды. Алынған нәтижелер қаржылық контексттегі тапсырмалардың оқушылардың математикаға қызығушылығы мен пәнге деген көзқарасына оң әсер ететінін көрсетті. Сонымен қатар, оқушылардың шынайы өмірге қатысты есептерді шешу дағдылары мен қаржылық түсінігі артқаны байқалды. Осы нәтижелер негізінде қаржылық сауаттылық элементтерін математика сабақтарына жүйелі түрде енгізудің маңыздылығы анықталды.

Кілт сөздер: қаржылық сауаттылық, математикалық ойлау, интегра - цияланған оқыту, функционалдық сауаттылық.

АННОТАЦИЯ

Данное исследование направлено на оценку эффективности методов развития финансовой грамотности в процессе преподавания математики. В рамках эксперимента учащимся 8-х классов предлагались математические задачи с финансовым содержанием, что позволило проанализировать влияние подобного подхода на их математическое и финансовое мышление. Участники были разделены на две группы: контрольная группа обучалась традиционным способом, тогда как в экспериментальной применялись интегрированные задания. Результаты показали положительное влияние финансово - ориентированных задач на интерес школьников к математике и их отношение к предмету. Также было зафиксировано улучшение навыков решения практических задач и повышение уровня финансового понимания. На основе полученных данных подтверждена необходимость системного включения элементов финансовой грамотности в школьный курс математики.

Ключевые слова: финансовая грамотность, математическое мышление, интегрированное обучение, функциональная грамотность.

INTRODUCTION

Research's relevance. The progress of financially literate citizens is one of the essential requirements for guaranteeing our nation's socio - economic stability in the context of globalization. Specifically, were improved during the financial literacy of the its strategically important for the state to start educating the younger generation at a young age. Kazakhstan has launched a number of extensive programs in recent years to raise financial literacy among different societal groups.

Directly related to Kazakhstan is where improvededing students' financial lite - racy overarching goal of long-term national growth. The "Kazakhstan-2050" Strategy, as evidenced by national initiatives and strategic documents like, high - quality education continues to be one of state's top priorities. These programs place a strong highlightedsis them need to make wise financial decisions on were were improvededing educational standards and giving people the tools.

On September 2, 2024 in his Address to the nation President Kassym-Jomart Tokayev highlightedsized the significance of incorporating fundamental digital and financial literacy into the curricula of both schools and universities. He underlined that being financially literate is an essential life skill that promotes making responsible and knowledgeable decisions. The "Debt - Free Society" initiative, which aims students to teach critical skills in investing, budgeting, and personal financial planning, have assigned the government and educational institutions the responsibility of stepping up efforts in this direction.

The Financial Sector progress – 2030 Concept, Kazakhstan's Agency for Regulation and progress of the Financial Market unveiled which offers a fully sive plan to increase public financial literacy. In order to achieve objectives these, the idea highlighted sizes preserving a stable financial environment, expanding public access to financial information and contemporary utilizing financial technologies.

Enhancing the digital infrastructure in education by encouraging the use of online learning resources, the Digital Kazakhstan state program also make to this endeavor substantial contribution. By developing their digital and financial literacy students and teachers benefit from these digital initiatives. The program paves the way for more adaptable, individualized learning experiences, especially in the fields of finance and economics, by updating educational materials and increasing access to distance learning.

For the progress of Higher Education and Science the main goals of the 2023–2029 Concept are to bring Kazakhstan's educational system into compliance with global norms. across colleges and research institutes is one of its top priorities. Developing students' financial and digital literacy. At the same time, new approaches to technical, vocational, and general secondary education demand that financial and economic subjects be included in school and college curricula. highlighted size these tactics also how crucial its for educators to receive ongoing training, especially in subjects like financial literacy and digital communication.

The advancement of digital transformation in education, when taken as a whole, these policy initiatives provide a clear path forward for the advancement of digital transformation in education, aid in educators' professional progress, and promote financial literacy. By incorporating mathematical exercises pertaining to finance into the teaching of mathematics, them provide a strong foundation for developing students' financial literacy. Furthermore, research from around the world suggests that the best way to increase students' financial literacy is to incorporate financial concepts into both stand-alone courses and core academic subjects, particularly mathematics. Students learn more than just theory when they work through real - world financial problems in math classes. These exercises aid in the progress of commonplace skills like long-term goal planning, careful financial decision-making, and budgeting. Kazakhstani students continue to demonstrate inadequate levels of functional literacy and mathematical reasoning, according to international tests like PISA and TIMSS. As a result, students must be able to solve real-world financial problems in addition to mastering theoretical knowledge.

Annually, Kazakhstan conducts social surveys to evaluate the population’s financial literacy. According to 2023 data, the national financial literacy rate stood at 40.5%, based on research by the Agency for Regulation and progress of the Financial Market of the Republic of Kazakhstan.

In 2025, Kazakhstan’s financial sector is undergoing considerable digital trans - formation. The National Bank and the Agency for Regulation and progress of the Financial Market plan to introduce the “Digital National Bank” concept. By shifting financial services to digital platforms, this initiative seek to strengthen the public’s financial literacy even further.

In a market-driven economy, both teachers and students share the responsibility of not only acquiring high-quality academic knowledge but as well understanding the financial dynamics of society — how to manage resources, use them usefully, and navigate economic challenges. These abilities are essential not only for future career success but as well for ensuring financial stability within the household. From this standpoint, the progress and application of a methodology to enhance students' financial literacy through the school mathematics curriculum has become an urgent priority. As a outcome, the selected research topic is directly aligned with our nation's educational and economic policies and is of great relevance.

Some of Kazakhstan's prominent scholars who has extensively explored the role and significance of problem-solving in mathematics education include Academician A. E. Abilqassimova, Professor E. Y. Bidaibekov, Professor A. K. Qagazbaeva, Academician O. A. Jautikov, Professor L. U. Jadraeva, among others.

Researchers like Annamaria Lusardi, Olivia S. Mitchell, Charles Anderson, Jane Kent, Deanna M. Lyter, Jurg K. Siegenthaler, Jean Ward, and Faisal Khan have all paid close attention to the growth of financial literacy on a global scale. Actually O. B. Baimuratov, K. E. Hasenova, S. Zhientaev, G. E. Kerimbek, and their associates have made important contributions to financial literacy education in Kazakhstan.

By comparing the degree of financial literacy in various nation, Annamaria Lusardi and Olivia S. Mitchell have investigated the state of financial literacy

worldwide. In his research, O. B. Baimuratov examined contemporary problems facing our country's investment policy and financial markets, highlighting the vital significance of increasing financial literacy. Even researchers K. E. Hasenova and S. Zhientaev has developed curricula and instructional materials aimed at improving the public's financial knowledge; their publications detail both the necessity and the most useful methods for integrating financial literacy into school programs.

In their research, Abylkassymova and colleagues investigated the continuity of mathematics instruction across secondary schools and pedagogical universities. Their findings suggested that the strategic incorporation of problems can significantly improve students' learning outcomes (Abylkassimova et al., 2020).

In the study "Role of Financial Literacy in Achieving Financial Inclusion: A Review, Synthesis, and Research Agenda," Khan, Siddiqui, and Imtiaz (2022) conducted an extensive analysis of 10,091 studies spanning 45 years and encompassing data from over 850,000 individuals. They concluded that higher financial literacy strongly correlates with increased financial inclusion and emphasized the need for more functional, applied teaching methods to effectively enhance inclusion outcomes (Khan et al., 2022).

Within Kazakhstan, the role of mathematics in imparting economic education at general secondary schools has been extensively explored by scholars such as R. A. Sadvakasova, Z. T. Seilova, G. R. Koschanova, and B. K. Momynbayev, among others, who has each made considerable contributions to this field.

Analysis of these works revealed that, in general secondary schools, the mathematics teaching process is oriented toward meeting the proficiency requirements established in the State Compulsory General Education Standards. but, it became apparent that a specific problem of fostering students' financial literacy within mathematics instruction has not been sufficiently examined as a distinct research focus.

An analysis of the PISA international assessment outcomes showed that students' competencies and skills in applying mathematical knowledge to real-life situations remain inadequate. This highlights the necessity of strengthening the applied dimension of the mathematics curriculum and integrating its content with practical contexts. That's why, an discrepancy emerges between the goal of developing financial literacy through financial-economic problems and the lack of a well-defined methodology for its implementation - identifying a core problem addressed by this research.

Addressing the enhancement of school students' financial literacy through mathematics teaching by reconciling theory with practice underscores the relevance of our study.

Objective of the study: to investigate methods for enhancing school students' financial literacy through the use of mathematical problems and to determine their usefulness.

Object of research: the process of forming the foundations of financial literacy in school students during mathematics lessons.

Subject of research: the instructional process of 8th-grade mathematics.

Research hypothesis: if, during the mathematics teaching process, tasks and pedagogical techniques aimed at developing financial literacy are employed, then school students will acquire financial-literacy skills and were improved in their life- and practice-oriented competencies.

The objectives, subject matter, and hypothesis of the dissertation enabled the following *research tasks* to be addressed:

1. Theoretical foundations. Analyze foreign and domestic studies on fostering financial literacy in mathematics education to establish the theoretical basis for the research.
2. Approaches. Identify useful ways to cultivate financial literacy within the mathematics teaching process.
3. Methodology progress. Design the content and methods for integrating financial-literacy tasks into the mathematics curriculum.
4. Usefulness Evaluation. Test and validate the proposed methodology's usefulness.

In order to address the objectives outlined above, the following research *methodologies* was employed:

- literature review: analysis of theoretical, pedagogical, psychological, and economic literature, curricula and methodological materials focused on developing students' financial literacy.
- empirical Investigation: observation of teaching practice, classroom monitoring, surveys, and tests to assess students' levels of financial literacy.
- experimental validation: implementation of theoretical propositions in the classroom, followed by data processing and statistical analysis; methodological foundations: the study is grounded in the theory of cognition and its philosophical principles, a learners - centered approach to instruction, and theories focused on shaping students' educational activities, it as well draws on interdisciplinary research in mathematics education — particularly studies, both domestic and internetional, on teaching students to solve problems with financial-economic content — by scholars and teacher - methodologists.

Theoretical foundations: this research builds upon philosophical, psychological, pedagogical, methodological, mathematical, and economic literature related to the topic, as well as on conceptual frameworks and approaches for teaching financial-economic problem solving in general secondary schools.

Data Sources: The Law on Education of the Republic of Kazakhstan; The "Kazakhstan-2050" Strategy; The "Bright Nation" National Project for Quality Education; State Compulsory Standards for Basic and General Secondary Education; Mathematics curricula, textbooks, and teaching–methodical complexs for 8th grade; Research and publications on financial-literacy progress and mathematics instruction (philosophical, psychological, pedagogical, methodological studies); Interdisciplinary pedagogical technologies that integrate mathematics and economics, including best practices.

Research Phases:

Phase I (2023–2024): Defined the research topic and collected theoretical insights on teaching financial literacy; Analyzed official school documents, state education standards, mathematics curricula, and textbooks; Formulated the initial objectives and hypothesis while clarifying the psychological-pedagogical and theoretical-methodological findations.

Phase II (2024–2025): Refined methodological principles and theoretical frame - works to deepen the study's focus. Systematized and critically analyzed theoretical and empirical data to establish a robust conceptual model. Investigated the psychological and pedagogical characteristics of students mastering real-world financial problems. Developed and tested strategies for solving financial-economic problems, including two rounds of cumulative assessments and surveys. Processed experimental and theoretical outcomes, formulated classroom implementation recommendations, and finalized the dissertation.

Scientific Novelty: A clear definition of the term "financial literacy" was provided, along with the theoretical underpinnings for fostering financial literacy through mathematics education. With a thorough explanation of its structure and main subject areas, a methodological framework for integrating financial education into math curricula was created. A collection of educational exercises designed to were improved financial literacy in students of different ages was created, along with useful and efficient methods for incorporating these exercises into regular teaching routines.

Theoretical Significance: The methodological framework that was developed describes the objectives, subject matter, methods of instruction, and teaching resources that are necessary to were were improvededing students' ability to handle financial and economic problems. It offers a methodical way to improve students' financial literacy through math instruction.

Practical Significance:

Teachers of mathematics can successfully encourage financial literacy in their students by incorporating the suggested strategies and materials into their regular lessons. The outcomes of this study have the potential to improve secondary school mathematics instruction by promoting important financial competencies and provide insightful information for curriculum design.

Key Principles for Defense:

1. Theoretical foundations and Methodological Structure: Define the content, structure, and teaching methods of the system for developing financial literacy within mathematics lessons.
2. Curricular Methodological System: Present specialized strategies and approaches for integrating financial-literacy progress into the mathematics curriculum, including useful ways to present financial concepts to students.
3. Experimental outcomes and Recommendations: Demonstrate the efficacy of the proposed methods based on the pedagogical experiment and provide practical guidelines for classroom implementation.

Total publications related to this dissertation: 2. Major findings were presented at the "BILIM KOKZHIEGI" Republican Scientific–Methodological Journal and at the CLXXI International Scientific–Methodological Conference "Innovative Approaches in Contemporary Science" in Moscow, Russia.

Research Base: the empirical study was conducted with 8th-grade students at Secondary School №129, under the Department of Education of Almaty city. Dissertation Structure. Introduction: Articulates the relevance, objectives, tasks, subject and object of study, hypothesis, methodological and theoretical foundations, scientific novelty, theoretical and practical significance, research phases, methods employed, key principles for defense, experimental outcomes, and publication record.

Chapter 1 ("Theoretical foundations for Developing Students' Financial Lite - racy in the Mathematics Teaching Process"): Explores the context of financial-literacy progress in mathematics education, clarifies the concept and importance of financial literacy, and outlines its structure and directions.

Chapter 2 ("Methodology for Teaching Students to Solve Financially Oriented Problems"): presents the methodological system (content, methods, organizational approaches, and tools) designed to enhance 8th-grade students' financial literacy through mathematics; reports on the experimental validation of the methodology.

1. LITERATURE REVIEW

1.1 The current state of fostering financial literacy through mathematical education in the modern educational system

In the context of contemporary education, the term functional literacy has gained considerable relevance and is widely recognized as a crucial concept. It describes a person's ability to apply their knowledge and skills usefully in everyday situations, social environments, and professional settings. Someone who is functionally literate can apply what them have learned to solve problems in the real world, adjust to changing circumstances, and participate actively in their community. This idea is becoming more and more considerable in the educational system, especially in the teaching and learning of mathematics. Numerous academic studies have examined its significance and evolution, and the definitions proposed by international educational organizations reflect these findings. This idea is becoming more and more considerable in the educational system, especially in the context of teaching and learning mathematics. Numerous scholarly investigations have examined its significance and evolution, and the definitions proposed by global educational institutions reflect this.

In the late 1950s, UNESCO publications introduced the idea of functional literacy. It was then described as the capacity to use mathematical, reading, and writing abilities in daily situations. UNESCO experts define functional literacy as applying fundamental academic skills, like reading and numeracy, to solve real-world problems and handle challenging circumstances. Its also seen as a crucial prerequisite for active engagement in the social, cultural, and economic facets of society.

Leontiev (2016) differentiates functional literacy from formal literacy, explai - ning that whereas formal literacy merely involves the ability to read and write, functional literacy encompasses advanced skills: retrieving relevant information, interpreting and synthesizing content, applying concepts to real - lifes situations, engaging in meaningful social communication, and adapting swiftly to changing environments. This conception resonates with current educational goals that emphasize not only the acquisition of knowledge but also its practical application in daily life (Leontiev, 2016; Vinogradova, 2018). Functional literacy, therefore, refers to the knowledge and competencies enabling individuals to actively participate in society, distinguished by the capacity to effectively use information, communicate purposefully, and adjust to evolving contexts (Leontiev, 2016).

Actually, functional literacy is essential to a person's social and cultural integration and goes beyond the simple acquisition of skills. It promotes people's capacity to thrive and make considerable contributions to their communities by assisting them in conforming to social norms and expectations. As a theoretical concept, functional literacy provides a means of fullyding one's place and identity in society and serves as the bridge connecting education and the complex nature of human activity.

Functional literacy has become a crucial element influencing people's partici - pation in social, cultural, political, and economic life in today's rapidly evolving

world. Additionally, its essential for encouraging lifelong learning. This type of literacy highlighted sizes a person's capacity for interpersonal interaction, situational adaptation, and clear and useful communication.

As a outcome, functional literacy is defined as a broad range of competencies required for meaningful engagement in a particular cultural context, including knowledge, practical skills, and adaptive abilities. Its a major force behind social integration and personal growth.

Several theoretical frameworks are used to examine functional literacy in the field of pedagogy, and each provides a unique viewpoint on the significance of this skill in instructional practice: Applying knowledge to actual circumstances:

1. The ability to apply fundamental skills to successfully navigate and overcome daily obstacles is known as functional literacy.
2. Readiness for social and a occupational roles:
3. Practical application of knowledge in daily life: A crucial component of functional literacy is the ability to approach real-world tasks and problems by usefully applying learned knowledge. This type of literacy reflects a person's ability and willingness to assume both formal responsibilities and voluntary commitments in social and professional contexts.
4. usefulness across a range of activity domains: This also includes the ability to function usefully and responsibly in a range of social and professional contexts.

Many academics have studied the idea of functional literacy from an educati - onal philosophy standpoint. Researchers like A.E. Abilkassymova, I.A. Kolesnikova, V.V. Matskevich, B.S. Gershunskiy, B. Street, and A. Palincsar have made noteworthy contributions.

Theodotou (2017) applied this perspective to early childhood education, demonstrating that literacy development among young learners is profoundly shaped by social interactions and community practices rather than mere decoding or formal instruction. Moreover, the expanded New Literacies, New Times entry further emphasizes that literacy encompasses a wide range of social practices shaped by ideology, power, and purpose — extending beyond the autonomous model to include multiple, context-dependent literacies. These posts reinforce in Literacy in Theory and Practice that functional literacy is a socially situated practice, continually influenced by cultural and institutional dynamics.

Recent studies build upon this model, emphasizing that functional literacy equips individuals to thrive within continuously evolving professional and socio-economic conditions (Nurmuratova, 2019). Functional literacy is intricately linked to students' cognitive, communicative, and social competences when viewed through the lens of competence theory (Khutorskoy & Lebedev, 2023). Cognitive competence includes abilities to set learning goals, plan and analyze tasks, guide one's own learning activities, reflect, and selfs - evaluate (Khutorskoy et al., 2023). Communicative competence involves effectively exchanging information, engaging in dialogues, and presenting ideas clearly to others. Meanwhile, social competence encompasses adapting to group roles and using literacy in diverse social contexts

(Khutorskoy & Lebedev, 2023). This framework highlights that functional literacy extends far beyond basic skills — it is an integrative foundation essential for students to navigate educational tasks and participate meaningfully in society.

For example, a cognitive competence encompasses the ability to direct one's learning activities plan and analyze tasks and perform self-assessment. A review of scholarly and methodological literature reveals that functional literacy comprises multiple domains: literacy in reading and writing, mathematical and scientific literacy, information-communication literacy, financial literacy, legal literacy, as well as cultural and ethical literacy.

Functional literacy's wide definition enables it to be viewed as more than just a level of knowledge; rather, its the capacity apply that knowledge successfully in a variety of situations throughout life. Stated differently, it shows that a student has mastered the skills necessary to successfully adjust to their social environment.

The ability to behave in a way that complies with social norms and the requirements of one's particular environment is closely related to functional literacy. A functionally literate person is one who can make well-informed decisions that meet the demands of the digital age and their line of work in today's technologically advanced society. These people are capable, flexible, and self-assured in a variety of social settings. Functional literacy is closely linked to the capacity to act in a manner that conforms to social norms and the demands of one's specific environment. A person who can make informed decisions that satisfy the demands of the digital age and their profession in today's technologically advanced society is considered functionally literate. These individuals are competent, adaptable, and confident in a range of social contexts.

Understanding one's place in society, communicating usefully, having im - portant personal traits, and exhibiting mastery of both general and subject, specific knowledge are all essential components of functional literacy. Mathematical literacy, which includes several key goals, is an essential part of functional literacy, which includes several key goals. Some of these include identifying and interpreting quantitative information in one's environment, fullyding the purpose and application of mathematical concepts in routine activities, recognizing, which includes several key goals, the relevance of mathematics in daily life, analyzing the relationships between mathematical elements, representing patterns and comparisons, and meaningfully classifying data. A crucial component of functional literacy is mathematical literacy, which encompasses a number of important objectives. These include being able to recognize and interprets quantitative information in one's surroundings, fully understand the purpose and application of mathematical concepts in routine tasks, understand the relevance of mathematics in day-to-day life, analyze the relationships between mathematical elements, represent patterns and comparisons, and classify data in a meaningful way.

Developing practical abilities like following detailed instructions, carrying out measurements and computations, resolving real-world problems, and expressing reasoning through suitable symbols and language used in mathematics (Table 1.1.1).

Table 1.1.1 Types of Functional Literacy

№	Content of Literacy	Competencies
1	Reading literacy	- engage with written material in a purposeful manner to build a coherent understanding of its message; - generate inquiries that probe the text's ideas and formulate thoughtful answers to deepen fullysion; - relate insights gained from reading to everyday situations, enhancing relevance and retention;
2	Writing literacy	- master the ability to write accurately, precisely, and without errors; - correctləy apply and justify the use of grammatical, syntactic, and punctuation rules in writing; - convey one's ideas fully, systematically, and clearly in written form.
3	Mathematical literacy	- understand and appreciate the role of mathematics in everyday life; - cultivate the ability to interpret and analyze numerical data presented in various formats; - apply mathematical knowledge freely and usefully to resolve a variety of real‑world situations.
4	Natural science literacy	- analyze and synthesize observed natural processes differentiate between primary and secondary characteristics of objects and phenomena; - differentiate core and peripheral features of phenomena; - apply scientific knowledge and inquiry skills practically.
5	Computer literacy	- develop the ability to efficiently search for and retrieve necessary information using computer systems; - gain expertise in confidently operating various computer hardware components and peripherals;
6	Information Literacy	- enhance skills in critically analyzing, interpreting, and synthesizing gathered data; - apply acquired knowledge usefully in real-life situations, enabling individuals to make sound and informed decisions.
7	Communicative Literacy	- engaged meaningfully in discussion by articulating one's viewpoint clearly and backing them with logical argument and appropriate evidence; - demonstrate attentives listening to fullyd and appreciates diverse perspectives, fostering respectful and productive communication.

A. K. Kagazbayeva defines functional mathematical literacy as a student's ability to apply mathematical knowledge effectively to solve real-world, practical problems, emphasizing this concept in her educational and methodological manual *Developing Students' Functional Mathematical Literacy* (Kagazbayeva, 2024). According to this view, mathematical literacy is not limited to abstract theoretical understanding; rather, it involves interpreting everyday situations, formulating problems in mathematical terms, and using appropriate methods to reach viable solutions. This equips students with the skills to navigate practical challenges using mathematics in their daily and future professional lives (Kagazbayeva, 2024).

This interpretation is consistent with the broader concept of functional literacy, which focuses not merely on the acquisitions of knowledge, but on its meaningful application in everyday life. Kagazbayeva's perspective underscores the importance of linking mathematical instruction to real-life situations. She highlights that functional mathematical literacy equips learners to address day-to-day challenges using their academic understanding.

On the other hand, functional mathematical literacy goes beyond understanding abstract concepts. It places a strong highlightedsis on using mathematical ideas practically to analyze real-world circumstances, create pertinent problems, and identify suitable solutions, and assess outcomes to facilitate thoughtful decision - making.

The ability to construct, use, and interpret mathematics in a variety of real - world contexts - whether social, professional, personal, or scientific is what the Programme for International Student Assessment (PISA) defines as mathematical literacy. This understanding aligns with contemporary educational models.One of the key learning objectives of contemporary education is for students to be able to recognize and solve real-world problems on their own by becoming proficient in a set of universal learning techniques. Because of this, its essential that students understand the usefulness of mathematics and draw obvious connections between abstract ideas and real-world scenarios. This viewpoint not only improved their ability to solve problems but also fosters a sincere admiration for mathematics as a useful and applicable subject.

The ability to use mathematical knowledge to solve common problems in daily life and a variety of professional contexts is known as functional mathematical literacy.This competence enables individuals to analyze situations mathematically, translate them into mathematical language, seek solutions, evaluate methods, interpret outcomes, and drew conclusions. In essence, functional mathematical literacy is a meta-disciplinary skill that allows individuals to use mathematical understanding usefully, flexibly, and consciously in various life contexts.

Mathematical literacy can be characterized by three key dimensions:

1. Understanding the importance of mathematics in contemporary society;
2. Expressing one's opinions logically and substantiating them through reasoned arguments;

3. Applying mathematical knowledge usefully to meet real-life needs. This concept underscores the student's ability to solve real-world problems by applying mathematical principles in daily life and extracurricular experiences.

Functional literacy development should be closely linked to nurturing an individual's interests and creative potential, according to V. S. Basyuk and G. S. Kovaleva (2022). They argue that fostering functional literacy requires systemic, comprehensive changes in education that cultivate innovative and adaptive personalities. Specifically, they emphasize the importance of developing students' initiative, critical and creative thinking, reflection, and self-directed learning — qualities that enable learners to respond effectively to diverse real-world situations and solve non-standard tasks (Basyuk & Kovaleva, 2022).

- when planning the content of education, its crucial not only to focus on mastering prior experiences but as well to consider the abilities and types of activities necessary for the student's future professional path;
- educational curricula must fully satisfy students' intellectual needs, ensuring a harmonious progress of general knowledge and professional preparation;
- there should be coherence and continuity between the content of subjects and the time allocated for their study; - useful methods and approaches should be selected and purposefully coordinated to foster the progress of students' knowledge, skills, and personal qualities.

These principles underscore the importance of aligning educational practices with the evolving demands of society, ensuring that students are equipped with the necessary competencies to navigate and contribute to the contemporary world. Functional literacy refer to an individual's capacity to apply acquired knowledge and skills to real-life situations, usefully addressing tasks across various professional fields and adapting to socio-economic progress. The ability to purposefully use the knowledge, skills, and competencies acquired through education to tackle a wide range of real - world problems is known as functional literacy in the field of education. A key element of this is mathematical literacy, which highlights the usefulness of mathematics in daily life. It helps people to meet current and future demands by using mathematical reasoning and making well-informed decisions. In addition to promoting academic success, this kind of literacy aids students in develop critical thinking and problem-solving abilities, which are critical for handling real-world circumstances usefully.

Key instruments for assessing the quality of education from the standpoint of functional literacy are international tests like the Trends in International Mathematics and Science Study (TIMSS) and the Programme for International Student Assessment (PISA).

The Organization for Economic Cooperation and progress (OECD) administers PISA, a test that evaluates 15-year-olds students' reading, math, and science skills with a focus on their ability to apply knowledge to practical contexts. In the meantime, the International Association for the Evaluation of Educational Achievement (IEA) administers the TIMSS, which assesses fourth and eighth graders'

proficiency in the science and the mathematics with an highlightedsis on their understanding and application of curriculum-based content.

These international assessments' tasks are especially made to gauge how well students apply the knowledge them have learned in the classroom to real-world situations. For example, in mathematics, students may required to read and evaluate graphs or diagrams, interpret percentages, and work through geometric problems. computations, or use statistical and probability-related ideas.

These assessments provide insightfuls information about students' functional literacy levels, demonstrating their ability to apply their theoretical knowledge in real-world contexts. Furthermore, the findings aid in determining how students' capacities to apply knowledge in a variety of real-world contexts vary by nation.
Kazakhstan first participated in the PISA evaluation in 2009, and it has continuously participated in subsequent cycles ever since.Due to the COVID-19 pandemic, 2021 assessment was postpones to 2022, outcomeing in Kazakhstan's non-participation that year. But in the 2022 PISA assessment, Kazakhstan achieved an average score of 425 in mathematics, ranking 46th out of 81 participating countries, an were were improved edingment from the 54th position in 2018 . This advancement signifies Kazakhstan's first entry into the top 50 countries in mathematics within the PISA framework. In the PISA 2022 assessment, fifteen-year-old students in Kazakhstan achieved an average score of 430 in mathematics—up seven points from their 2018 outcome of 423 yet still 42 points below the OECD average of 472. Only 2 % of Kazakh participants reached the highest proficiency bands (Levels 5–6), compared with an OECD average of 9 %. Within the CIS, Kazakhstan’s score trailed both Belarus (472) and Ukraine (441), and lagged far behind global frontrunners such as Singapore (560) and Macao (535). The full PISA 2022 report was published in December 2023, and no new international assessment took place in 2024; the next PISA cycle is scheduled for 2025.

In the fully digital TIMSS 2023 cycle, Kazakhstan’s fourth graders averaged 487 points in mathematics—on par with the French Community of Belgium (489) and France (484), and well above Malaysia (411). Eighth graders scored 454, edging out Qatar (451) and again surpassing Malaysia (411), but remaining 24 points below the international mean of 478. Compared with the paper-based TIMSS 2019, these scores represent a drop of 25 points for fourth grade and 22 for eighth grade, a decline attributed in part to COVID-related learning interruptions and the shift to computer-based testing. TIMSS is administered every four years, so no 2024 data are available; the next digital cycle is set for 2027. Already, TIMSS 2023 outcomes are informing revisions to Kazakhstan’s mathematics curriculum and bolstering efforts to strengthen students’ numerical literacy.

Tai and Lin (2015) investigated the relationship between students’ problem - solving approaches and their overall mathematical literacy, using data from PISA 2012 for Taiwanese 15-year-olds. They found a strong association: students who employ independent, transformational strategies — characterized by flexible, inventive reasoning — achieve higher scores in mathematical literacy compared to peers relying on procedural algorithms or dependency on external cues (Tai & Lin,

2015). This suggests that fostering such adaptive problem-solving approaches can significantly enhance students' ability to apply mathematics in authentic real-world contexts.

Badger (2021) emphasizes that Singapore Math focuses on developing a deep conceptual understanding rather than relying on rote memorization or repetitive drills. By reducing the number of topics covered in the curriculum and dedicating more time to each, students are encouraged to engage with real-world problems. This method not only strengthens their computational abilities but also nurtures conceptual clarity and strategic thinking, helping learners apply mathematics meaningfully in everyday and academic contexts (Badger, 2021).

The suboptimal performance of Kazakhstani students in international assess - ments such as PISA and TIMSS can be attributed to a confluence of factors spanning curriculum design, pedagogical practices, socio-economic disparities, and systemic educational challenges. Key Contributing Factors:

- curricular limitations and assessment design: the existing curricula often lack interdisciplinery and real-life application tasks, which are essential for developing functional literacy;
- deficiencies in textual literacy skills: students exhibit difficulties in engaging with complex, structured texts, hindering their ability to extract and apply information usefully;
- curriculum and textbook shortcomings: there are notable gaps in the educational content and resources, including outdated or misaligned textbooks, which fail to meet contemporary educational standards and the evolving needs of students.
- professional progress and teacher qualifications: many teachers do not have access to ongoing professional training or the required credentials. Because of this shortage, teachers is less able to implement creative teaching strategies and stay up to date with changing educational trends, which can lead to outdated or inuseful instructional practices that negatively impact student learning outcomes.
- socioeconomic inequality: students from disadvantaged families frequently face additional challenges that can have a detrimental impact on their academic performance and personal growthes, further separating them from their more advantaged peers. These differences in socioeconomic backgrounds also leads to considerable disparities in access to educational resources, after - school support, and a stable learning environment.
- regional imbalances: students in rural or isolated areas usually face an shortage of qualified teachers, inadequate infrastructure, and fewer learning opportunities. There is also an discernible difference in the quality of education between urban and rural areas.

Kazakhstan has launched a number of extensive educational reforms to address these urgent problems and raise the standard and equity of its educational system:

1) State Program for the progress of Education and Science (2020–2025): This strategic initiative is centered on modernizing educational content to reflect

professional standards, strengthening teacher preparation, and embedding functional literacy elements into the curriculum. The program place strong highlighted side on developing an competencies of both students and educators ensure that the education system can usefully respond to contemporary societal and technological demands;

2) "Educated Nation" National Project: This large - scale reform project is designed to raise the overall quality of secondary education, reduces the performance gap between urban and rural schools, and were improvededing student outcomes in international evaluations. By targeting regional disparities, the project seek to promote greater educational equity and support sustainable national progress.

The project aims to support sustainable national progress and advance greater educational equity by addressing regional disparities.

This strategic endeavors demonstrate Kazakhstan's steadfast dedication to addressing the intricate problems confronting its educational system and were were improvededing its outcomes in upcoming international tests. The goals of the ongoing reforms is give students the fundamental knowledge and abilities them need to prosper in a world that is becoming more dynamic and interconnect by the day.

It is commonly acknowledged that international large-scale tests like the Programme for International Student Assessment (PISA) and the Trends in International Mathematics and Science Study (TIMSS) are crucial instruments for assessing the caliber of education from the standpoint of functional literacy, which includes financial and mathematical competencies. In addition to evaluating students' factual knowledge, these tests gauge their capacity to apply what they have learned in practical settings, which is a strategy that is highly compatible with the idea of financial literacy in education.

Students in the fourth and eighth grades participate in the TIMSS, which focuses on curriculum-based accomplishments in science and math. In addition to emphasizing mastery of the material taught, it offers insight into students' capacity for reasoning, problem-solving, and mathematical application—skills that serve as the cornerstone for comprehending financial concepts in later educational stages.

PISA, which is given to 15-year-old students by the OECD every three years, focuses more on evaluating how well students apply mathematical reasoning to real-world problems, including ones that have financial ramifications. For instance, PISA incorporates activities that are directly related to financial literacy, such as analyzing data, comparing prices, creating budgets, and comprehending taxes. In addition to computational abilities, these tasks call for critical thinking and well-informed decision-making.

This is why national strategies to improve financial literacy through mathematics education are increasingly using PISA and TIMSS as benchmarks. In order to help students develop the functional competencies necessary for responsible financial behavior in adulthood, their frameworks encourage curriculum developers to incorporate real-life financial contexts into math lessons. The growing importance of financial literacy in handling the intricacies of the modern financial environment is highlighted by its evolving understanding. Although previous definitions mostly address fundamental financial knowledge modern Interpretations give more weight to

the growth of practical skills the ongoing acquisition of financial knowledge and the capacity to use this knowledge usefully in everyday situations(Table 1.1.2).

Table 1.1.2 Scholars' Views on Financial Literacy

№	Scholar	Definition of financial literacy
1	Zambrano Franco(2017)	In its early understanding, financial literacy were largely associated with mere acquisition of financial knowledge but contemporary perspectives highlighted size more fullysive view, acknowledging that sound financial decision - making depends not only on what individuals know, but as well on their capacity apply that knowledge usefully in real-life contexts. This ability is further shaped by external factors such as income level, educational background, and access to financial resources and services.
2	Warmath & Zimmerman (2019)	Financial literacy are an essentials life competency that enables individuals to manage their financial resources wisely and make informed choices. It encompass not only an understanding of key financial principles — such budgeting, saving, investing, and debt management. But also practical ability to apply this knowledge in everyday financial situations.
3	OECD (2020)	Financial literacy extend beyond the basic fullysion of financial concepts. It encompases the capacity to evaluate and manage financial risks, make thoughtful and informed decisions, and usefully apply financial knowledge to both personal and professional contexts.
4	Rodríguez-Correa et al. (2025)	Financial literacy encompass the knowledge and skills required to manage one's personal finances usefully, covering areas such as budgeting, saving, investing, and debt management. It equip individuals to make informed financial decisions, contributing not only to theirs personal financial stability but as well to the overall economic well - being of society.

The contemporary definition of financial literacy reflects its growing signifi - cance in a complex and quickly changing financial environment. The idea, which was once thought to be limited to having rudimentary financial knowledge, have since broadened to include a variety of useful abilities and conduct necessary for efficient money management in the modern, digital, and information-rich world. In addition to fullyding financial concepts like investing, saving, and budgeting, financial literacy

now entails using these ideas with assurance in daily decision-making and long-term financial planning.

According to Warmath and Zimmerman (2019), financial literacy is a multidimensional construct that goes beyond knowledge alone to include practical skills and self-efficacy essential for managing real-world financial challenges. They propose a formative scale — grounded in Bloom's taxonomy — that integrates explicit financial knowledge, applied financial skills, and self - efficacy, arguing that financial literacy is a dynamic capability evolving with economic changes and technological innovation. Robust financial literacy enables individuals to assess risk, engage in future planning, and make prudent decisions that bolster both personal and economic well-being. Yet, its prevalence remains a global concern; for instance, approximately half of U.S. adults lack a basic grasp of financial concepts (World Economic Forum, 2024), underscoring the urgent need for comprehensive financial education frameworks.

This demonstrates the pressing need for educational programs that integrate applied learning techniques and useful financial skills in addition to theory.

Globally, nations are starting to acknowledge this need and are enacting specific changes in financial education. Japan, for example, has taken a tiered approach, introducing age-appropriate financial concepts in early education before progressively moving on to more complicated subjects like risk assessment and investments. Throughout their academic career, students are guaranteed to gain a thorough understanding of financial responsibility thanks to this progression, which also gives them the skills them need to make sound financial decisions in their personal and professional lives.

Australia has similarly advanced in this field. Since its launch in 2022, the Ecstra Foundation's "Talk Money" program has reached over 406,000 students across 1,408 schools, significantly improving their financial capability and confidence (Ecstra Foundation, 2025). These initiatives epitomize global efforts to close the financial literacy gap and foster financially responsible, informed future generations. Considerable strides have been made in the US to incorporate financial literacy into formal education. As of 2024, high school graduates in 26 states are required to complete financial literacy courses. This policy is a major step toward preparing young people for adult financial responsibilities, such as managing debt, creating a budget, choosing wisely when to invest, and fullyding the basics of insurance. The increasing movement to incorporate an practical financial education into school curricula is indicative of a larger change in educational priorities, which go beyond academic theory to guarantee that students have the necessary life skills. The way that financial literacy is viewed and given priority in educational systems around the world has been greatly influenced by tests such as the OECD's Programme for International Student Assessment (PISA). These evaluations highlight the fact that financial literacy encompasses both knowledge and the ability to apply that knowledge in practical situations. To ensure that students are not only academically capable but also financially prepared for adulthood, such evaluations highlight the importance of integrating financial literacy into national curricula through topics like

economic understanding, personal budgeting, savings, and investment planning. Including real - world financial scenarios in educational materials about consumer credit, mortgages, insurance, and investments gives students the skills them need to understand intricate financial systems and make wise financial decisions as them grow up. By successfully bridging the gap between theoretical knowledge and real-world application, this method makes sure that students are more equipped to handle the financial realities of contemporary life.

Scholars like G.R. Koshanova, R.A. Sadvakasova, D.B. Toibazarov, K.Zh. Aganina, and V.V. Shestel have considerablely advanced economic and financial education in Kazakhstan. Their study highlights the necessity of integrating financial literacy into the larger educational framework so that students can gains the cultural awareness necessary for responsible decision-making in addition to the fundamental financial competencies. Their efforts are in line with international programs designed to develop financially literate individuals who can support both their own financial security and the general economic stability of the community.

1.2 The role of financial and economic problem-solving in developing school students' financial literacy

Solving problems is a key component of secondary mathematics education since it helps students better understand abstract mathematical ideas and how them used in the real world. With these exercises, students actively interact with mathematical material, hone logical thinking skills, and acquire knowledge of how mathematics is used in real-world situations all essential elements of functional mathematical literacy.

Extensive research highlights problem solving as a powerful means to deepen conceptual understanding in mathematics education. The National Council of Teachers of Mathematics (NCTM) asserts that instructional programs should enable students to “build new mathematical knowledge through problem solving; solve problems that arise in mathematics and in other contexts; apply and adapt a variety of appropriate strategies to solve problems; [and] monitor and reflect on the process of mathematical problem solving” (NCTM. They further emphasize that effective problem-solving tasks — characterized by multiple entry points, varied solution strategies, and real - world contexts — promote creativity, foster mathematical discourse, and support the development of deep understanding (Wilkerson, 2022).

Students encouraged to try out different approaches, apply mathematical thinking in a variety of contexts, and critically evaluate their methods as them work through problem-based assignments. Along with were were improvededing them mathematical proficiency, this process help them develop critical thinking, flexibility, and analytical reasoning skills that are critical for dealing with problems in the real world. Therefore, incorporating problem-solving skills into the mathematics curriculum is essential to helping students become functionally mathematically literate and ensure that them are equipped use their mathematical knowledge in reals - world situations.

Scholars like T.A. Aldibaeva, A.E. Abilkassymova, L.D. Jumalieva, and B. Baymukhanov have made considerable contributions to the theoretical and methodological advancement of mathematics education in Kazakhstan. Them Research highlights how important problem - solving skills are for developing students' mathematical abilities and promoting functional mathematical literacy.

The pedagogical value of mathematical problems its thoroughly examined by A.E. Abilkassymova in her textbook Methodological Foundations for Teaching Solution of Mathematical Problems in General Education Schools.

Abylkassymova et al. (2023) explore the multifaceted role of mathematical problems within the teaching–learning process, advocating that problems are not merely endpoints but dynamic resources central to instruction and assessment. They identify multiple functions of problem solving—including instructional, educational, cognitive, and evaluative roles — emphasizing that integrating problem-based tasks enhances students' conceptual understanding and application of mathematics. Consequently, this comprehensive approach positions mathematical problems as both the means and ends of mathematics education, highlight their pivotal role in fostering deep learning and meaningful engagement in mathematical concepts.

These days, when classifying mathematical problems by their scope and linguistic features, text-based (word) problems are the most commonly encountered type. According to L. M. Friedman, word problems in the school mathematics curriculum consist of exercises where students must interpret a verbal scenario and determine the value of an unknown quantity.

Extensive review of contemporary research, methodological treatises and cur - rent textbooks reveals that word problems in school mathematics are most usefully categorized according to problem scope, content domain, and linguistic features. First, narrative (story) problems frame mathematical questions within a coherent storyline, asking students to translate events and character actions into quantitative relationships. Second, contextual (practical-oriented) problems situate tasks in everyday scenarios—such as budgeting household expenses or scheduling activities—thereby highlighting mathematics' relevance to real-life decision-making. Third, applied (practical-content) problems focus on concrete, domain-specific applications—calculations of area for construction, analysis of statistical data, or financial computations like interest and loan amortization—so that procedural fluency is developed in directly useful contexts. Finally, interdisciplinary problems integrate mathematical reasoning with other subject matters—physics problems involving motion, chemistry tasks calculating concentrations, or financial-economic models assessing cost and revenue—thereby requiring students to draw upon multiple knowledge domains simultaneously.

In narrative word problems, real-world processes such as motion, labor, formation of alloys, mixing or dissolving substances (concentration), material substitution, and other similar activities are modeled. Accordingly, these problems can be grouped based on a mathematical content them explore—percentages, quantitative relations, movement, productivity, mixtures and solutions, alloy composition and concentration, differences, and multiplicative ratios(Table 3).

Contextual word problems comprise tasks that help illustrate the importance of mathematics in interpreting and navigating the surrounding world. Them are aimed at demonstrating how mathematical reasoning and tools are applicable to real-life situations and decision-making processes.

The applied orientation of *mathematics* involves problem-solving scenarios derived from real-life contexts, expressed in mathematical terms. These tasks promote the integration of theoretical knowledge with practical application, enabling students to recognize the relevance of mathematics beyond the classroom. Numerous scholars and educational practitioners from Kazakhstan and other CIS countries has contributed to this area. Among the widely recognized are A.K. Bekbolganova, M.V. Egupova, D.B. Toybazarov, N.A. Tereshin, R.A. Sadvakassova, I.M. Shapiro, N.V. Vakhrusheva, A.B. Dmitrieva, E.A. Tuyakov, whose works has laid the findation for useful methods in teaching applied mathematics through practical, real-life contexts. Researchers emphasize that applied mathematical problems are grounded in real-world contexts and integrate mathematical modeling skills. Larina (2016), in her empirical study of algebra problems given to secondary school students, identifies key characteristics of these tasks: situational relevance, mathematical modeling, and non-trivial structure. She found that only a subset of textbook word problems truly qualify as "real-world," based on these criteria (Larina, 2016). This definition highlights that applied problems must present authentic contexts and require students to formulate, analyze and solve a non-routine tasks that go beyond mere procedural exercises.

Word problems are crucial tool in the teaching of mathematics because them helps students understand how mathematics and other academic subjects are related. Students' thorough subject knowledge is were improvededingd by these problem, which frequently include real-world contexts like physical, chemical, or financial-economic scenarios. Many academics, such as I.D. Zverev, A.V. Usova, and V.N. Maksimova, contend that interdisciplinary problems are an essential means of encouraging cross-disciplinary integration in the classroom.

In the process of teaching mathematics, the use of applied problems gives a number of positive results:

- solving such tasks, students is convinced that science is really applied in life, and the knowledge received at school is confirmed to practice;
- in the process of working on applied tasks, important an mental skills are developed, such as analysis, generalization, understanding the essence, the ability to highlight the main points, compare and an find similarities;
- the solution of such tasks makes the educational activity of students more creative and meaningful.

The following requirements apply by applied tasks used in an mathematics lessons: a) the conditions of the task must be close to an real life; b) the content of the task should be understandable and accessible to students; c) the received solution should have practical application.

In the educational process, is it important to regularly train students to apply mathematical knowledge obtained in lessons in real life situations. Unfortunately,

many schoolchildrens shows no interest in an mathematics and not always understand why it is needed. Therefore, it is necessary for the teacher to explain the importance of applied problems, to shows that mathematics is closely connected with reality and can lead to surprising results. This will helps develop interest in the subject and increase motivation to study.

Applied tasks reveal the practical power of knowledge, allows students to see how school mathematics can be used to solve everyday problems. Thanks to such tasks, even students with low performance can make progress. Some school textbooks already have tasks with practical elements, but in general there are not enough practical tasks in mathematics textbooks. Therefore, it is the important for the teacher not to the limit him only to tasks from the textbook, but to supplement them with examples from scientific literature related to real life. Getting students to analyze and solve practical situations based on an school knowledge is an important step on the way to forming functional and financial literacy.

A useful teaching tool that successfully bridges the fields of economics and mathematics is the use of financial - economic word problems. Students have worthwhile opportunities to use their mathematical knowledge in practical financial situations thanks to these problems. As them work through these problems, students gain a deeper fullysion of economic reasoning and the mathematical concepts, equipping them with the knowledge and abilities needed to make wise financial decisions in their daily lives.

Brosseau and Blanchet (2021) highlight the importance of integrating financial contexts into mathematics instruction at an early stage in secondary school. Their research in Quebec demonstrates that embedding financial numeracy — such as investment planning, interest calculation, and budgeting — within the mathematics curriculum significantly enhances students' conceptual understanding and their ability to apply mathematical concepts in real - world financial situations. This approach not only strengthens practical skills needed for personal financial management but also fosters deeper comprehension of core mathematical principles (Brosseau & Blanchet, 2021).

In order to foster both mathematical proficiency and financial competence, Savard and Cavalcante (2024) highlightedsize vital significance of integrating financial literacy into the mathematics curriculum. Them argue that basic financial concepts, like percentage calculations and arithmetic operations, are essential to financial education and ought to be methodically included in math classes. This integrated approach equips students with the practicals knowledge required for managing personal finances, including budgeting, saving and investing, in addition to reinforcing fundamental mathematical skills. According to their research, students are more engaged and have an better grasp of how abstract ideas relate to real-world situations when mathematical tasks are presented in financial contexts. Teachers can increase students' understanding of mathematics and give the subject more purpose by relating it to well - known, everyday scenario. Students' motivation and interest in mathematics are increased by this contextualized approach, which also gives them

valuable life skills that will eventually enable them to handle difficult financial decisions with most competence and confidence.

Incorporating financial literacy into mathematics instruction were were improvededings student engagement while also giving students the skills them need understand basic economic principles, manage personal finances, and make wise financial decisions.

Incorporating financial literacy into mathematics instruction serves two purposes: it promotes functional literacy, which is a more general educational goal, and it also strengthens students' academic engagement. This method equips students to use their knowledge in relevant ways in real-world situations. Students gain the ability to make responsible financial decisions - from understanding credit and making wise investments choices budgeting and saving combining financial education with the mathematical education.

This teaching approach is in the line with worldwide movements that stress how critical its to get student ready for the financial realities of adulthood. By doing this, it help create well - rounded people who can competently and confidently negotiate the challenges of modern life. Integrating financial literacy into math curricula is an essential step in preparing the next generation for both individual financial success and active engagement in an economically informed society as its becoming much widely acknowledged as an crucial life skill. The relationship between mathematics and practical applications is highlighted when financial and economic concepts are incorporated into the mathematics curriculum in general education schools. The need solve common human problems and fully the world around us gives rise to mathematics. curriculum.

How well - versed in economics is today's graduate?

In contemporary life, we frequently encounter financial terms such as bank interest rates, deposits, stocks, refinancing rates, inflation, currency exchange rates, stock exchanges, loans, and more. Professional business requires not only considerable knowledge but as well the ability to accurately assess the potential outcomes of financial operations. As a outcome, from the school stage, its essential for students to acquire knowledge about the market economy, its laws, and opportunities, enabling them to adapt to social and public changes, live in a rapidly developing society, pursue self-education, apply acquired knowledge in real life, and realize their full potential. In daily life, we often perform arithmetic operations such as shopping, taking and repaying loans, used banking services, and calculating interest rates. Another point , many branches of moderns mathematics are usefully used in financial services, including probability theory, mathematical statistics, and methods of mathematical analysis. In this context, a financial-economic word problems play a crucial role in developing financial literacy during mathematics instruction, as them teach students to usefully apply mathematical tools in understanding economic situations. Integrating financial-economic topics into the mathematics curriculum in general education schools is a considerable aspect of implementing financial education. The interdisciplinary connection between mathematics and economics can be ensured through the following methods:

- demonstrating to students the relationship between mathematical concepts and financial-economic notions;
- applying theoretical knowledge and skills acquired in mathematics to solve financial-economic word problems.

So, applying the connections between mathematics and economics in various fields of human activity adds new requirements to the general and practical significance of the education system, highlighting the need to adapt students to economic life in accordance with modern demands. In today's market society, every individual, participating in economic processes, must has a clear understanding of financial services and tools and able to use them usefully for their benefit. In the changing conditions of the market economy, the primary task of general education schools is to form an intellectually, physically, and spiritually developed individual, satisfying their need for knowledge that ensures success and rapid adaptation society.

The connection between mathematics and economics imposes new require - ments on the education system, necessitating the adaptation of students to economic life. In the current market society, each person must be able to usefully use economic processes. Under the changing conditions of the market economy, the main goal of schools is to educate an intellectually, physically, and spiritually developed citizen, fulfilling their need for knowledge that ensures social adaptation and success.

The importance of a socio - economic mathematical problems in the school mathematics course:

- *Educational value.*

Socio-economic tasks occupy an important place in mathematics lessons. In the process of solving them, a students get acquainted with new topics, learn to apply the knowledge they have gained to solve problems of financial and economic content, and try out different methods of solving them. Such tasks reflect real - life situations and help to understand the relationship between economic concepts. They contribute to the establishment of interdisciplinary connections, deepen understanding of the material, get acquainted with a new methods of solving and develop mathematical knowledge, skills and abilities, which has a positive effect on the general level of preparation in mathematics.

- *Role in the development of thinking.* During the implementation of socio - economic tasks, a students learn to analyze conditions, translate them into mathematical language, create models, choose effective methods of solution, and compare different approaches. Mathematical modeling become a important tool in solving problems of financial and economic content. This helps to develop a economic thinking and form the foundations of financial literacy.
- *Practical significance.*

By solving such tasks, students learn to apply their mathematical knowledge in real-life situations, especially in an issues related to money and the economy. They begin to understand the connection between mathematics and economics, and become familiar with concepts a such as labor productivity, cost, and other economic terms. Socio - economic tasks have great practical significance, since they not only provide

theoretical an knowledge, but also teaches them to make independent decisions, find ways to increase work efficiency, and evaluate specific situations.

- *Educational significance.*

Tasks with a life and financial content also play an educational role. They helps schoolchildren develop a respect for an labor, planning, accounting, control and the rational use of resource in both production and personal life. Such task contribute to the formation of a careful attitude to money, things, and time, and teach them to find rational ways to save.

- *Control significance.*

Socio - economic tasks can be used to test students' knowledge and an business acumen. They can be used to monitor how well a student has understood the a learning material and how they are applying is in practice. These tasks are also suitable for peer an review, reflection, and self-assessment, making them a useful tool not only for the teacher, but also for the student themselves.

1.3 Methodological foundations for preparing students to solve financial and economic problems

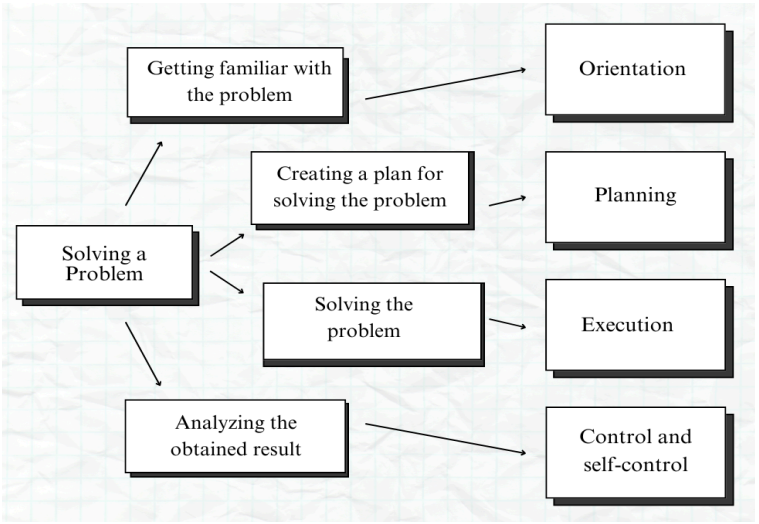
Every day we are surrounded by various tasks: where is the cheapest place to buy products? In which store the prices are more affordable for an ordinary buyer? These are all examples of a life situations that require making decisions based on elementary calculations. Often such tasks seem simple and repetitive, because they have become a habitual part of our everyday life. However, in the world is constantly changing, and with it, new tasks appears that require new solutions.

That's why it's important to form the basis of financial and a economic thinking in students. In order for graduate to be ready for life in the conditions of an market economy, it is necessary to develop their economic understanding and learn to apply mathematical knowledge to solve practical problem that they face in a real life.

Orienting school students toward solving financial and economic problems is one of the key directions that helps them acquire essential life skills and knowledge. In the process of learning such problems, students not only apply mathematical concepts but as well gain elements of financial literacy. Them become familiar with real-life situations such as percentage calculations, income and expenses, and money circulation, which allows them to practice making informed financial decisions. An useful teaching methodology for such tasks develops both mathematical and economic thinking in students and lays the foundation for them to become financially literate individuals in the future. One of the most important ways to help schoolchildren learn vital life skills and information is guide them toward resolving financial and economic issues. Students acquire aspects of financial literacy in addition to applying mathematical concepts while working through such problems. They gain experience with real-world scenarios like money circulation, income and expense calculations, and percentage calculations, which enables them to practice making wise financial decisions. An effective teaching strategy for these kinds of assignments helps students think mathematically and economically, laying the groundwork for them to become financially literate adults in the future.

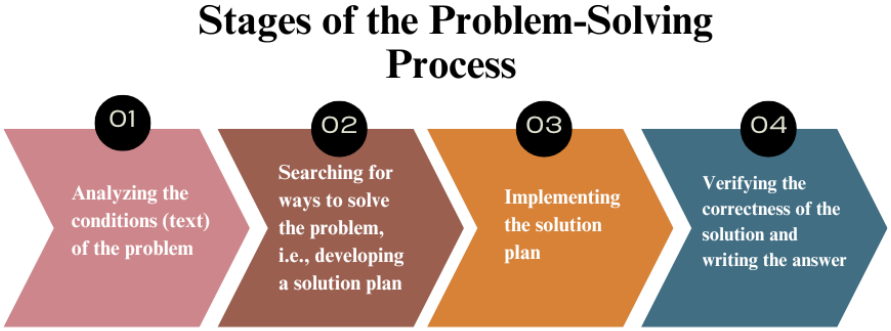
L.M. Fridman outlines the key components of the problem-solving process as follows: analyzing the problem statement, developing a plan for the solution, carrying out the plan, and verifying the outcome. Based on this approach, the process of solving mathematical problems can be described through the following steps: familiarizing oneself with the problem, creating a plan to do solve it, executing the solution, and analyzing the get outcome in Figure 1.3.1.

Figure 1.3.1 Step-by-Step stages in problem solving



The process of solving mathematical problems in a structured, sequential manner is regarded as a fundamental strategy in teaching mathematics. Researchers such as A.E. Abilkassymova, V.I. Krupich, E.I. Lyashchenko, Yu.M. Kolyagin, and G. Polya has all highlighted sized the importance of analyzing the problem-solving process through distinct phases. Them has proposed various frameworks that decompose the act of solving a problem into systematic steps, as illustrated in Figure 1.3.2.

Figure 1.3.2 Stages of the problem-solving process



Numerous scholars emphasize that orienting students toward solving financial and economic problems in mathematics classes equips them with vital life skills and foundational financial literacy. As evidenced by a study on integrating numeracy and financial education, school-based mathematics instruction that incorporates real-life

financial contexts — such as percentage calculations, income and expenses, and money circulation — enhances both students' mathematical competence and their ability to make informed financials decisions (HRPUB, 2020). This practical teaching methodology fosters the development of economic thinking and supports students in the applying mathematical concepts in everyday situations, laying a strong groundwork for lifelong financial well-being.

In their instructional manual *Methodological Foundations for Teaching Mathematical Problem Solving in General Education Schools*, Tuyakov and Abilkassymova (2023) present a structured four - stage model for teaching students how to solve mathematical problems. This framework positions problem-solving as a sequential and reflective process, helping learners to first analyze problem statements, then develop strategies, carry out their planned steps, and finally check their solutions for correctness and coherence. Such a systematic methodology supports deeper mathematical thinking, enhances cognitive self-regulation, and is aligned with modern competence-based standards in secondary mathematics education.

1) *Analyzing the conditions of the problem:* Before solving a mathematical problem, its essential to fully fully its content and break it down into key components. The main goal at this stage is to identify the known values, the unknowns, and the objective. Its as well important to determine the type of problem and, if necessary, present its core idea using a diagram or short description. To organize the solution process, questions such as "What is known?", "What is unknown?", and "What needs to be find?" should were used. The initial steps include: 1. Carefully reading and understanding the problem context. 2. Clearly identifying the given information and the values to be find. For proof-based problems, both assumptions and conclusions must be distinguished.

2) *Searching for ways to solve the problem:* The plan for solving a problem can take various forms: verbal or written instructions, as well as visual representations such as diagrams, models, or schematics. When guiding students in developing such plans, structured questions and step-by-step prompts can be particularly useful. 1. Initially, students should be encouraged to recall whether them has encountered a similar problem before. Its beneficial to analyze the conditions and structure of the previously solved problem, identifying both similarities and differences. If the student has prior experience, developing a plan becomes more straightforward. If not, developing an similar new task can encourage in-depth fullysion and assist in determining a potential course of a action. 2. When pupils unable to come up with a comparable problem, them ought to go over the initial terms and concepts again, making sure to remember their definitions. 3. Make sure that all available data are carefully taken into account during the planning stage. 4. Rephrasing the original problem by changing its initial conditions or reinterpreting the intended outcomes, without affecting its essential meaning, is a efficient method for solving mathematical problems. This method can simplify difficult problems, particularly those involving equation or inequality systems. A clearer and more useful route to a solution is frequently made possible by simplifying expressions into equivalent but more manageable forms. 3) Putting the solution plan into action: Following the formulation

of an well - defined plan for problem-solving, its imperative that each step be carried out precisely and logically.

At this stage, students should pay close attention to the problem's structure, show accuracy, and have an firm grasp of the underlying mathematical framework. The following suggestions could helps ensure that the solution is implemented successfully: Use exact mathematical terminology, apply pertinent properties of mathematical objects, and double-check each step for accuracy.

3) *Verifying the solution:* Students should verify that the solution satisfies all of the problem's requirements and, if at all possible, solve it using a different approach for comparison in order to verify the solution's dependability. Is it possible for an object to exist that has the qualities listed? Ensuring this both logical and mathematical operations has been properly to executed is essential for a correct and fullysive solution.

The solution stages outlined in essential for guiding students through the process of solving word problems efficiently. These stages help students develop optimal methods for tackling such problems. It's important to note that during the solution process, the steps may be interconnected and sometimes repeated. As a outcome, its crucial to teach students to fully use all four stages in their approach. In the mathematics curriculum of general education schools, students encounter financial and economic terms such as labor productivity, production norms, prices, cost price, excise taxes, exchange rates, inflation, taxes, and the consumer basket. An analysis of textbooks for grades 5–11 published by "Mektep" and "Atamura" revealed a limited inclusion of financial and economic content. but, its noteworthy that in the textbooks published by the "Mektep" publishing house, authored by A.E. Abilkasimova and others, financial and economic content is incorporated through topics like "Mathematics in My Life", "Mathematics in the Life of a Cook", "Mathematics in Everyday Life", "Mathematics in Business" among others. These textbooks are enriched with problems aligned with these themes.

In the Grade 5 mathematics textbook authored by A.E. Abilkasymova, T.P. Kucher, and Z.A. Zhumagulova, the instructional approach is designed to encourage students' independent inquiry. The textbook provides tasks that prompt learners to seek out necessary information and scientific data, thereby fostering fullysive progress and a holistic understanding of the world. This methodology aims to cultivate critical thinking skills and promote active engagement with the learning material. In the "Mathematics" textbook, problems related to calculating value and price are presented. While solving such problems, students not only use concepts like price and value but as well encounter terms such as "discount", "tax", "salary", and "deposit" during the study of the "percentage" section. Additionally, students learn to plan expenses and assess profits when purchasing goods.

As previously outlined, the process of solving mathematical problems consists of four main stages. In order to teach students how to solve problems with financial and economic content, this process should begin with practical tasks.

Let us consider Exercise №112 from the 5th-grade mathematics textbook as an example.

«The doctor told the patient to take one type of medicine three times a day for ten days. This medicine is sold in two different packages. One package contains 12 pills, and the other contains 16 pills. The price of the first package is 880 tenge, and the second costs 1350 tenge.

1. How many pills does the patient need in total ?
2. Which package is more cost-useful for the patient ?».

Problem-solving process for Exercise №112:

Stage 1 – Understanding the problem. We begin by analyzing the content of the task. The key questions to consider are: «How many times per day and for how many days must the patient take the medicine?», «How many pills are in each package?», «What is the price of each package?» By answering these questions, we can determine the required number of pills and the most cost-useful option for purchasing the medicine.

Stage 2 – Planning the solution. Based on the problem statement, we need to calculate:

a) The total number of pills required for the treatment;

b) The cost of purchasing the required number of pills using each available packaging option;

c) Which option is more economical. We apply the basic formula:

Total cost = (Number of packages) × (Price per package)

Stage 3 – Carrying out the solution.

a) The doctor prescribed the medicine three times per day for ten days:

3 pills/day×10 days = 30 pills

b) We calculate how many packages are needed in each case:

First package (12 pills):

We need: 30÷12 = 2.5 → we round up to 3 packages.

Total cost: 3 × 880 = 2640 tenge.

Second package (16 pills):

We need: 30÷16 = 1.875 → we round up to 2 packages.

Total cost: 2 × 1350 = 2700 tenge

Stage 4 – Verifying the solution.

Both packages give enough pills: first one gives 36 pills (more extra pills); second one gives 32 pills (closer to 30).

But the first package is cheaper: 2640 tenge < 2700 tenge

Final Answer:

1. The patient needs 30 pills in total.
2. Its cheaper to buy the first package (12 pills for 880 tenge).

Exercise №120 from the 5th-grade mathematics textbook as an example.

A family consisting of two adults and two children wants to travel from Astana to Almaty and back. Them need to buy tickets for both directions. Table 1.3.1 shows some of the train numbers operating in the Astana – Almaty direction. Compare the departure times and ticket prices of the trains, and draw a conclusion. Determine the minimum total cost the family will spend for a round trips. If the family consists of 4 members (2 adults and 2 children), calculate the minimum amount spent on tickets.

Table 1.3.1 Trains from Astana to Almaty

Train No.	Route	Departure Time	Ticket Price (Adult)	Ticket Price (Child)
002	Astana – Almaty 2	14:02	25000	12500
004	Astana – Almaty 2	13:30	28200	14100
010	Astana – Almaty 1	12:25	16500	8250
006	Petropavl – Almaty 2	09:35	24500	12250
040	Kostanay – Almaty 1	13:05	10500	5250

Solution: The most expensive ticket cost 28,200 tenge. The shortest travel time was 9 hours and 35 minutes (Train No. 6). Determine the minimum amount of money the family will spend for a round trip. If the family consists of four members, the minimum cost for tickets will be:

$10500 \times 2 + 5250 \times 2 = 31{,}500$ tenge.

The longest travel time was 14 hours and 2 minutes (Train No. 2).

Exercise №666.

According to global data, pastures occupy 3,390 million hectares of land. The pastures in our country make up 30:565 of the total global pasture area. How many hectares of pastureland are in our country?

Solution: Country pasture area = $30 : 565 \times 3390$

Calculate: $30 \times 3390 : 565 = 101700 : 565 = 180$ million hectares

Answer: 180 million hectares.

Exercise №667. The price of 1 meter of fabric is 880 tenge.What is the cost of 0.4 meter of fabric ?What is the cost of 3.125 meters of fabric ?

Solution:

1) 0.4 meter of fabric: Cost = $0.4 \times 880 = 1760:5 = 352$ tenge
2) 3 and 1:8 = 25:8 meters of fabric: Cost = $25 : 8 \times 880 = 22000 : 8 = 2750$ tenge

Answers: 1) 352 tenge, 2) 2750 tenge.

In the 8th - grade *Algebra* curriculum, this type of word problem is covered under the topic “Solving Word Problems using Quadratic Equations.”

Example - 1: A borrower took a loan of 900,000 tenge from a bank. The repayment plan is as follows: at the end of the first year, the borrower pays 610,000 tenge to the bank; at the end of the second year, the borrower repays the loan with interest by depositing 426,000 tenge.

Assuming the bank charges a fixed annual interest rate, what is the annual interest rate? Let the bank's interest rate be t %.

Solution:

The multiplier per year is: $x = 1 + t : 100 = 1 + 0.01t$

At the end of the first year, the borrower owes the bank: $900{,}000 \cdot x$

After paying 610,000 tenge, the remaining debt becomes: $900{,}000x - 610{,}000$

At the end of the second year, this amount grows again by the same rate:

$$(900{,}000x - 610{,}000) \times x = 426{,}000$$

$$900{,}000x^2 - 610{,}000 \times x = 426{,}000$$

$$D = (-610) \times (-610) - 4 \cdot 900 \cdot (-426) = 372{,}100 + 1{,}531{,}200 = 1{,}903{,}300$$

$$x_1 = (-(610{,}000) + \sqrt{1{,}903{,}300}) : (2 \times 900{,}000)$$

$$x_2 = (-(610{,}000) - \sqrt{1{,}903{,}300}) : (2 \times 900{,}000)$$

Solve the quadratic equation using the quadratic formula.

$x_1 \approx 1.1052$ $x_2 \approx -0.4274$ then we should convert to percentage , for the next step we will multiply each root to 100%.

$x_1 \approx 1.1052 \times 100\% \approx 11\%$ and $x_2 \approx -0.4274$ (is a negative).

Answer: 11%

Example - 2:

After two salary increases, the salary increased by a factor of 1.44. The second increase was 1.5 times greater (in percentage) than the first increase.

By what percentage did the salary increase the second time?

Solution: Let the first increase be r (as a decimal, not a percentage). Then the second increase is 1.5r (since it's 1.5 times greater in percentage). After first increase: salary becomes (1+r). After second increase: salary becomes (1+r)(1 + 1.5r)

We are told the final salary is 1.44 times the original, so:

$$(1 + r)(1 + 1.5r) = 1.44$$

$$(1 + r)(1 + 1.5r) = 1 + 1.5r + r + 1.5r^2 = 1 + 2.5r + 1.5r^2$$

Multiply both sides by 100 to eliminate decimals:

$$150r^2 + 250r - 44 = 0$$

So, calculate discriminant: $D = 250 \times 250 + 4 \times 150 \times 44 = 62500 + 26400 = 88900$

$$x_1 = (-250 + \sqrt{88900}) : (2 \times 150) \approx 298.16$$

$$x_2 = (-250 - \sqrt{88900}) : (2 \times 150) \approx 0.1605$$

(We ignore the negative root since a negative percentage increase doesn't make sense.) Second increase (in decimal) is: $1.5r \approx 1.5 \times 0.1605 = 0.2408$

Convert to percentage: $0.2408 \times 100 \approx 24.08\%$.Then second increase: $1.5 \times 16 = 24\%$

Answer: 24%

The topic «solving word problems» in the Grade 9 Algebra textbook is aligned with the learning objective 9.4.2.1, which focuses on solving word problems using systems of equations."

Example 3: A portion of money was invested into two different bank accounts: one with an annual interest rate of 6%, and the other with 4%. The total annual income from the investments was 500,000 tenge. If the amounts had been swapped between the two accounts, the income would has been 520,000 tenge.

How much money was invested in total?

Solution: x = amount invested at 6%, y = amount invested at 4%

Then:

Original income:

$$0.06x + 0.04y = 500{,}000 \quad (1)$$

Swapped income:

Now x is at 4%, and y is at 6%:

$$0.04x + 0.06y = 520{,}000 \quad (2)$$

Step 2: Solve the system of equations. We have:

$$0.06x + 0.04y = 500{,}000 \quad (1)$$
$$0.04x + 0.06y = 520{,}000 \quad (2)$$

Let's eliminate decimals by multiplying both equations by 100:

Step 2: Solve the system of equations. We have:

$$6x + 4y = 50{,}000{,}000 \quad (1)$$
$$4x + 6y = 52{,}000{,}000 \quad (2)$$

Multiply equation (1) by 3: $18x + 12y = 150{,}000{,}000$

Multiply equation (2) by 2: $8x + 12y = 104{,}000{,}000$

Now subtract (1) from (2): $(18x - 8x) + (12y - 12y) = 150{,}000{,}000 - 104{,}000{,}000$

$10x = 46{,}000{,}000 \Rightarrow x = 4{,}600{,}000$

Now plug x=4,600,000 into equation (1): $4y = 22{,}400{,}000 \Rightarrow y = 5{,}600{,}000$

Answer: Amount invested at 6%: 4,600,000 tenge.

Amount invested at 4%: 5,600,000 tenge.

Total amount invested: 10,200,000 tenge.

Example 4: A worker is hired to dig a trench. He is paid 4,000 tenge for the first meter, 6,000 tenge for the second, and for each additional meter the payment increases by 2,000 tenge. If the worker digs 12 meters, how much will he earn in total?

Solution: First term $a_1 = 4000$; second term $a_2 = 6000$;

common difference $d = 6000 - 4000 = 2000$;

number of terms $n = 12$.

Use the formula for the sum of the first *n* terms: $S_n = n(2a_1 + d(n-1)):2$

Substitute values: $S_{12} = 12(2\times4000 + 2000(12-1)) = 180000$

Answer: 180000 tenge.

An analysis of pedagogical, psychological, philosophical, methodological, economic, and mathematical literature underscores the necessity of establishing methodological foundations that highlight the significance of financial-economic word problems in fostering financial literacy among students in general education schools. Financial-economic word problems serve as a pivotal tool in the mathematics curriculum to develop students' financial literacy. Through these problems, students grasp the concepts of "functional literacy," "functional mathematical literacy," and "financial literacy," discerning their similarities and differences, and learning their appropriate applications. Drawing upon scholarly research, functional literacy is defined as the learner's ability to usefully use acquired knowledge, skills, and competencies in various situations to solve real-life problems.

The applied orientation of education presupposes the construction of goals, con - tent and educational tools, which provides a meaningful connection between mathematics and practice - both in terms of content and methods. This allows students in the process of mathematical modeling not only to acquire theoretical knowledge, but also to acquire skills that will be useful both in study and in real life situations.

Table 1.3.2 Stages of solving financial and economic word problems

Problem-Solving Stages	Description of actions at each stages	Outcomes at the end of each Stage
1	2	3
Introducing the financial-economic word problem and analyzing its context.	Read and review the problem, break it into meaningful parts, and reflect on its content.	Understand the real-life relevance of the scenario and grasp key requirements and financial-economic terms.
Understanding the financial-economic object, process, or phenomenon in the task.	Recall relevant mathematical and financial knowledge. Identify key terms and update prior understanding. Represent financial relationships using symbols, diagrams, graphs, tables, and formulas.	Explain through real-life examples and recognize personal relevance. Encourage students to integrate math and financial knowledge by constructing a suitable mathematical model.
Developing a plan to solve the financial-economic problem.	Clarify and explain relationships between economic elements by answering guiding questions. Identify the most useful solution method.	Understand the link between the problem's conditions and its question, and master the mathematical model representing the financial-economic situation.
Executing the solution plan in practice.	Implement the problem-solving steps, give verbal explanations to reinforce understanding of economic relationships, and carry out the sequence of actions leading to the outcome.	Fulfill all conditions of the task.
Analyzing the solution outcome. Conducting additional analysis of the problem.	Verify the solution, write the answer in full or briefly. During discussions with students, focus on the following areas: - Discussing mathematical or economic conditions; - Complicating the task; - Creating a similar problem with different numbers and solving it; - Applying the learned concept and related new ideas; - Identifying new, useful information.	Evaluate how the outcomes align with the economic situation under consideration. Transition from general concepts to real-life scenarios. Strengthen students' understanding of terminology, grasp the practical significance of solutions, understand the role of mathematical knowledge in solving economic problems, and deeply fully the problem.

During the research, interactive methods was usefully used to develop students' financial literacy through word problems. Additionally, the structure of the problem-solving process for financial and economic word problems was clarified, along with the roles and actions of both the teacher and the student at each stage. The stages involved in solving such problems can be clearly presented in a table format (Table 1.3.2).

Creating mathematical models helps students to solve tasks of different levels of complexity. As a rule, level A tasks is considered simpler, while level B tasks require a little more in-depth analysis and effort. When performing such tasks, in addition to strong students, much students need to additional, clear and targeted helps from the teacher for a successful solution.

So, we have determined that its possible to develop financial literacy during various stages of solving financial and economic word problems and has established the methodological foundation for teaching how to solve such problems.

2. METHODOLOGY

2.1 Teaching methods and approaches in mathematics to form students' understanding of financial concepts

In the modern world, financial literacy has become an indispensable part of everyday life. Mathematics lies at the heart of economic decision-making, offering individuals essential tools to interpret and apply abstract ideas to real-life financial scenarios. The close relationship between mathematics, finance, and economics is foundational to delivering useful financial education

As a key competency for the 21st century, financial literacy is increasingly recognized within the context of mathematics education. Students' ability to critically assess and handle financial difficulties is strengthened when mathematical concepts—such as equations, functions, models, and graphical analysis—are integrated.

The methodological goal of forming school students' financial literacy in the process of learning mathematics is develop school students' practical skills in solving economic concepts and textual problems through the implementation of interdisciplinary connections, improving their mathematical knowledge, expanding them thinking skills, as well as teaching them to solve real economic and financial problems in a field of financial services through mathematical activities.

Teachers are urged embrace to creative approaches and make use of a variety of pedagogical strategies in order to spark students' interest in mathematics and show its relevance in real-world situations. Teachers take on the role of a facilitators in this process by establishing precise learning objectives, planning lessons in an organized way, and choosing materials that speak to the interests and needs of their students. Students actively interact with the content within this framework and the teachers oversee fullysion, direct instruction, and evaluate students' academic performance.

The primary objective of mathematics education in a contemporary schools is to develop students' the logical reasoning abilities and foster their functional literacy. By encouraging active student participation, inquiry - based learning, and the progress of critical thinking abilities, the revised curriculum aims to further this goal.

In mathematics education, the application of contemporary pedagogical strategies, digital tools, and interactive learning methodologies promotes teamwork and give students more agency over their education. Teachers must carefully choose and arrange their lesson plans within an to logical methodological framework in order to guarantee efficacy.

Including financial literacy in mathematics instruction has several important benefits, including fostering interdisciplinary relationships, introducing fundamental economic ideas, were improvededing students' problem - solving skills, expanding them fullysion of mathematical concepts, and preparing them to handle financial and economic difficulties in a real - world situations.

In this regard, taking into account educational goals and a requirements for general mathematical knowledge, we have tried to create an methodological system for the development of financial literacy aimed at providing students with the

opportunity to apply the mathematical knowledge gained in class in practical life situations, as well as highlighting it main components.

Several important goals have been listed in order to successfully pursue this goal:

- Create interdisciplinary links by relating mathematical ideas taught in grades 5 through 11 - such as percentages, number systems,
- fractions, equations, functions, graphs, and inequalities - with fundamental economic concepts;
- Adopt and implement teaching strategies and educational exercises that considerablely aid in the growth of students' financial literacy throughout the entire teaching and learning process; Encourage students to use mathematical structures represent and analyze financial situations; promote mathematical modeling as a method for solving a real-world economic problems; and cultivate fundamentals financial management abilities, such as personal budgeting, income and a expense planning, long-term goal-setting, and practical to household financial management.
- Cultivate a sense of responsibility in making financial decisions and understanding their an long - term impact;
- Strengthen students' cognitive abilities by engaging them in solving problems that incorporate financial and economic content.

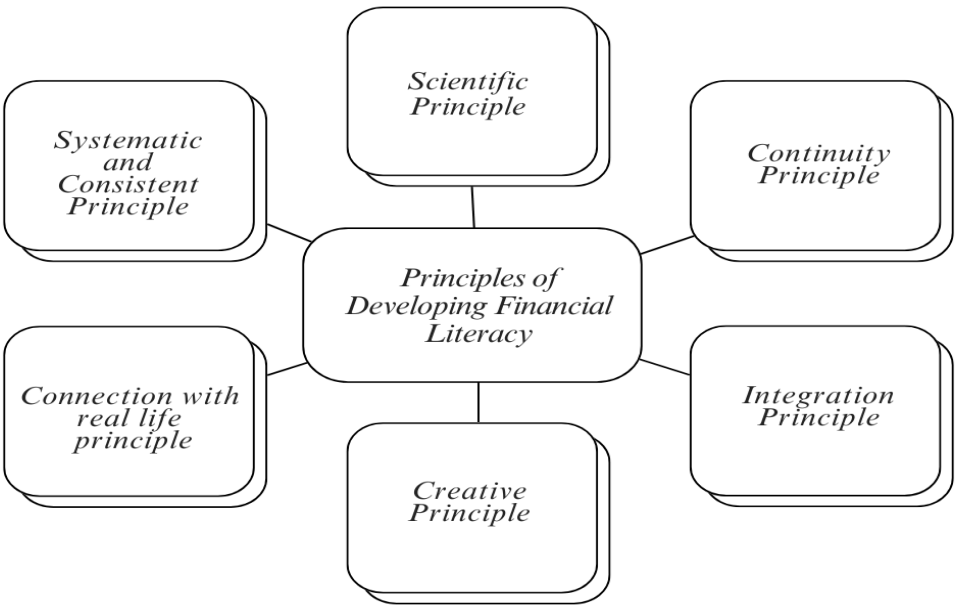
To implement these goals usefully, the content and structure of the curriculum must be designed to foster students' financial literacy, support the progress of economic thinking, and allow for the meaningful integration of interdisciplinary approaches.

The teacher (subject of education) sets a specific learning goals, plans the learning process and selects the learning content. The object of learning is the student, the teacher conducts the lesson, monitors the quality of a knowledge gained, analyzes the learning process, and draws conclusions. The goals of teaching mathematics in the modern school are, first of all, the development of logical thinking and functional literacy of students. An updated educational content is an aimed at solving these goals and objectives, at the developing students' learning activities, research skills, and critical thinking.

In her foundational work on mathematics education, Abylkassymova (2023) identifies a comprehensive set of principles underpinning both the theory and methodology of teaching mathematics. These include goal orientation, progression-focused instruction, problem-based learning, methodological alignment, content expansion, modeling, coherence, professional relevance, and differentiation. She further establishes general didactic requirements: scientific rigor, educational value, visual clarity, consciousness and activity, durability of knowledge, systematicity and sequential progression, and feasibility. Abiding by these methodological and didactic principles enables educators to effectively determine the content and approaches for integrating financial literacy into mathematics teaching, thus laying a robust foundation for developing students' financial literacy skills

through subject-based instruction (Abylkassymova, 2023). By adhering to these methodological and didactic principles, its possible to determine the content and methodological foundations for developing students' financial literacy through the teaching of mathematics in 2.1.1.

Figure 2.1.1 Core principles of the methodology for developing financial literacy



The content of the school mathematics course is formed on the basis of the state general compulsory education standards of the Republic of Kazakhstan. It is reflected in the standard curricula for the following subjects: mathematics (grades 5–6), algebra (grades 7–9), geometry (grades 7–9), algebra and basic analysis (grades 10–11), geometry (grades 10–11). These programs are aimed at implementing educational goals at the levels of basic, general secondary and technical/vocational education. One of the key tasks of the methods of teaching mathematics its the construction of a didactic system, which includes forms of organization of the educational process, methods and teaching tools those ensure the mastering of students' basic knowledge according to a curriculum, the development of their cognitive abilities and the formation of an skills to apply the acquired an knowledge in practice.

The main objective of mathematics teaching methodology is to provide students with a solid foundation of knowledge within the framework of these curricula, to develop their cognitive abilities, and to teach them to apply acquired knowledge in real-life situations. To achieve this, a didactic system should be established, encompassing various forms, methods, strategies, and tools for usefully organizing the educational process.

Let us now briefly elaborate on to each of the principles.

Scientific principle. The instructional content presented to students must align with the current state of scientific knowledge. It should not only provide a deep understanding of cognitive laws but as well enable the practical application of this

knowledge in solving real mathematical problems and tasks. Students should receive instruction that reflects current scientific knowledge. It must provide a thorough understanding of cognitive principles and enable students to apply this knowledge to practical mathematical problems and tasks, going beyond theoretical explanation.

Principle of continuity, consistency, and systematicity. A methodically orga - nized, logically consistent, and ongoing learning process is necessary to guarantee the successful assimilation of scientific knowledge. Learning components to should be introduced in a logical order, connected logically, and arranged gradually when creating instructional content. Concepts and information should progressively increase in complexity and scope.

The real-life connection principle.

Integrating academic material with real-world scenarios is an essential tactic for improving students' financial literacy. Students can apply their knowledge in meaningful and applicable ways during lessons when instructional materials are connected to real-world situations. Connecting academic material with real-world situations is a successful strategy for raising students' financial literacy. Students are better equipped to apply their knowledge in meaningful and pertinent ways when instructional materials are linked to real-world, everyday situations. This enhances their fullysion and makes what them learn more applicable.

The creative principle. Selecting educational resources should take into account the age-related traits of the pupils. The material must foster independent thought, spark cognitive interest, and foster innovative problem-solving skills. The progressive stages of the students should be taken into account when choosing instructional materials. The selected material should stimulate students' intellectual curiosity, encourage self-directed thinking, and develop their ability to solve problems creatively and analytically.

The integration principle.

Dismantling strict boundaries between subjects is an component of fully edu - cation. Since it allows students to approach the material from multiple perspectives and fully the connections between various fields of knowledge, its crucial to integrate educational content around common themes and real-world contexts. Students can better understand economics concepts, terminology, and mathematical models when mathematics is taught using the integration principle. The integration of mathematics and economics in the educational process requires the teacher to build such a methodical approach, which will allow to systematically direct the teaching of mathematics to the formation of economic knowledge and the development of students' relevant skills. This presupposes the development of educational content that reflects this relationship in the methodological system of teaching. The content component of such a system covers both the process of teaching mathematics lessons and the active cognitive activity of the students themselves. The structure content part of the methodical formation of financial literacy through an teaching of mathematics is based on the integration of mathematical and economic knowledge. This is especially relevant in modern conditions, when society expects a certain level of economic a preparation from schoolchildren already during schooling. Modernization

of mathematical education, strengthening of is practical orientation create prerequisites for implementation of new educational initiatives.
Let's now examine how financial literacy can be included in the mathematics curriculum for general education schools' fifth through eleventh graders (see Table 2.1.1).

Table 2.1.1 Content areas aimed at developing financial literacy within the school mathematics curriculum

Grade	Content of financial literacy
Grade 5	Students are introduced the concept of the value of banknotes and the formula for calculating purchasing power: price × quantity = value. Them well work on solving simple word problems relating to percentages and bank interest, such as calculating price increases or reductions, discounts, and sales promotions. Furthermore, students engage with problems concerning family budget expenses and its planning.
Grade 6	Calculating percentages, solving problems related to price increases or reductions, and determining salary and tax amounts using proportions. Additionally, presenting the breakdown of the family budget in tabular form.
Grade 7	Problems related to costs in the study of the concepts of functions and linear functions. As an application of linear functions, demand and supply functions are introduced. Word problems involving the sale of goods, price or salary increases and decreases, as well as exchanging coins for different banknotes are as well considered.
Grade 8	Word problems related to calculating deposits with changing annual interest rates, solved using square roots and quadratic equations, as well as using formulas for bank loans paid in two installments.
Grade 9	Tasks related to bank deposits, salaries, product prices, wholesale warehouse prices, and family budgets. Calculating accumulated interest (compound interest) using the n-th term of a geometric progression. Calculations for various types of loans and deposits based on the sums of arithmetic and geometric progressions.
Grades 10-11	Solving financial problems using exponential and logarithmic functions. Applying formulas for bank loans and deposits. Determining the minimum loan conditions that meet specific requirements.

By studying the content of the mathematics curriculum and textbooks for grades 5-11, the financial and economic concepts that students must master and their meanings has been defined in Table 2.1.2.

Table 2.1.2 Meaning of financial and economic concepts for math sections

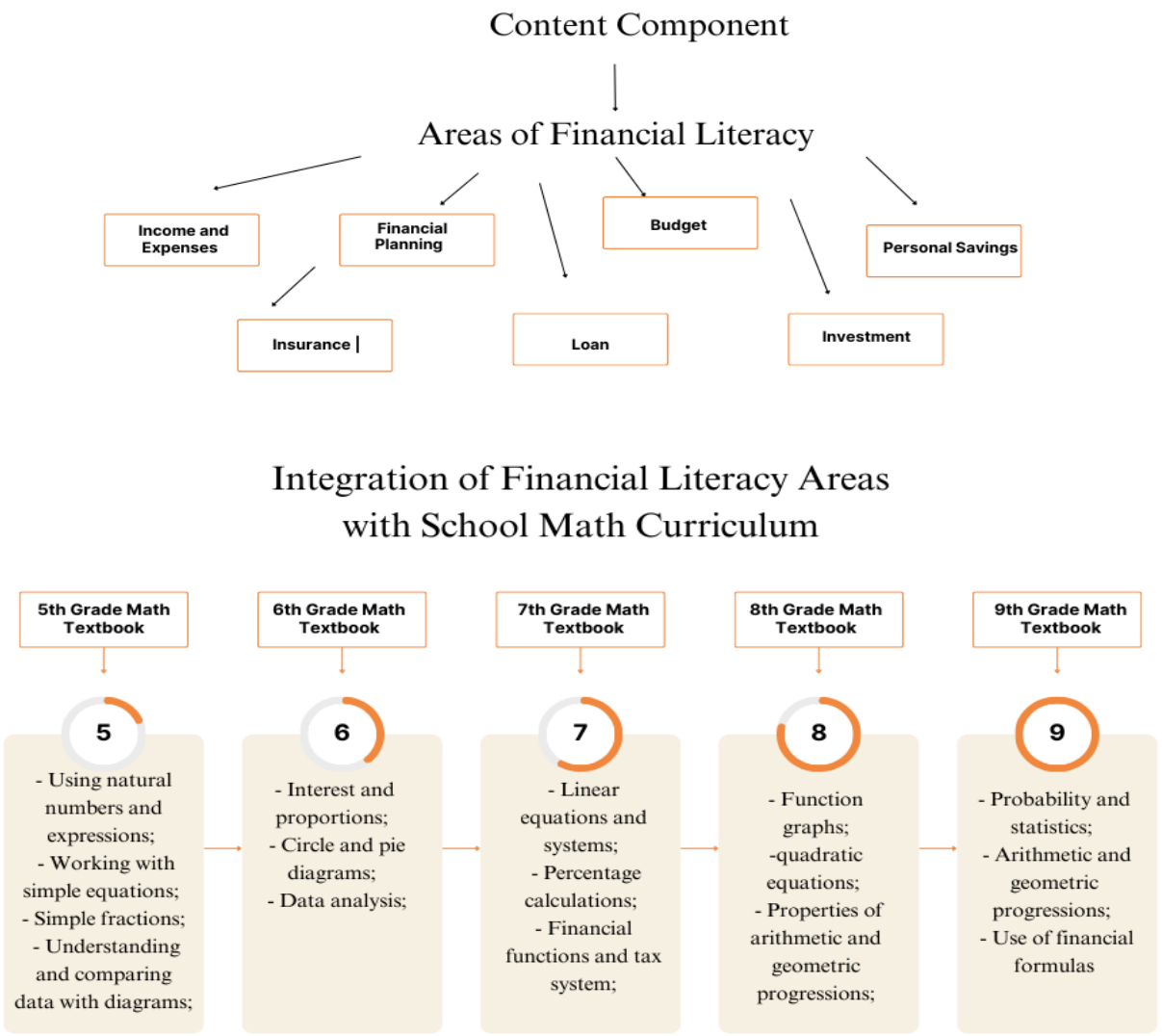
Sections	Topics	Meaning of financial and economic concepts
Natural numbers	Performing arithmetic operations with natural numbers.	- understanding that salary is the monetary reward for labor and the main source of family income; - recognizing the role of salary as a factor that influences income growth; - understanding ways to earn income through bank operations involving foreign currency. - forming an understanding of individuals who deposit funds into banks.
Fractions	Performing arithmetic operations with fractions. Multiplying decimal numbers. Calculating the average value of several numbers.	- understanding the significance of salary in the structure of product cost; - learning methods for calculating average salary; - understanding the principles of how the hourly wage system affects the amount of salary; - realizing that pensions are a form of financial support provided by the state based on work experience and age.
Percentages	Performing calculations using percentage relations.	- acquiring the skill of calculating simple interest; - learning methods for calculating compound interest.
Progressions	Solving problems based on arithmetic and geometric progressions.	- identifying factors that influence salary growth; - understanding the meaning of price increases and decreases; - acquiring the skill of calculating taxes.

In real-life social contexts, economic analysis helps both to develop mathema - tical thinking and to reinforce economic knowledge. Based on this, the structure of the content component of the methodological system has been developed(Figure 2.1.2). This integrative approach not only strengthens cognitive skills like logical reasoning, abstraction, and quantitative analysis, but as well promotes informed decision-making. By embedding real-world economic problems into mathematics education, learners become more engaged and are better prepared to apply their knowledge in meaningful ways outside the classroom.

The procedural component of the methodological system refers to the practical implementation of financial literacy progress in mathematics education. It comprises a structured set of teaching methods, instructional techniques, and organizational

forms that collectively aim to introduce and reinforce the essential elements of financial and economic knowledge.

Figure 2.1.2 Content component of the methodology for developing financial literacy in mathematics education



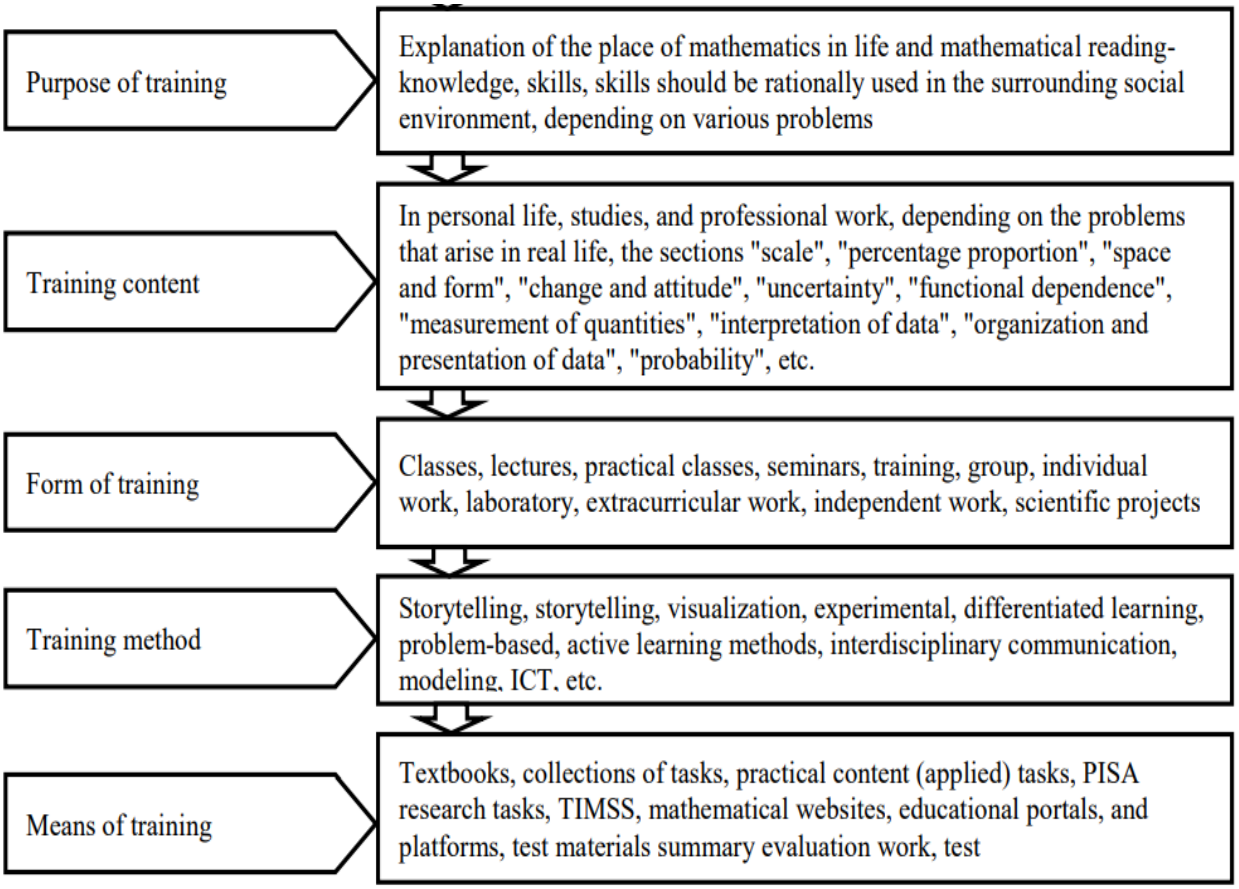
This component ensures that the learning process is not limited to the transmission of theoretical information but highlighted sizes active student engagement, practical application, and critical thinking. For instance, methods such as project-based learning, case analysis, and simulation activities allow students to apply mathematical principles to realistic financial contexts — like calculating interest rates, comparing investment options, or managing a household budget. Also we can add, the procedural component involve differentiated instruction tailored to students' age, ability levels, and learning styles. In order to develop methodology for the formation of financial literacy of students, we will consider the main methodological approaches to the organization of process of teaching mathematics:

competence approach; practical - oriented approach; system - active approach; communicative approach; integrative approach; research approach.

The competence approach, which is the basis of a methodological principles of the formation of financial literacy, is aimed at combining the educational to process with real life. Is helps to understand the essence of financial literacy, to reveal its structure and content, as well as to a determine its place in the system of key competencies of the student.

In addition, the competence approach strengthens the practical orientation of education: it allows students to apply the theoretical knowledge obtained from the school mathematics course solve real - life problems, learn innovative skills and develop the ability to find practical solutions in the field of personal finance.
Teachers may employ interactive techniques such as group discussions, role - playing, and real - life problem - solving scenarios to encourage collaborative learning and an deeper understanding. This component is presented in Figure 2.1.3.

Figure 2.1.3 Methodological framework(methods) of formation students' financial literacy in mathematics



To usefully cultivate students' ability to apply mathematical reasoning in financial contexts, its imperative to develop their proficiency in mathematical operations. This includes solving problems related to simple and compound interest, equations and inequalities, graphing, and sequences like arithmetic and geometric

progressions. Mastery of these topics enables students to approach economic word problems with confidence and competence.

2.2 Methodology for guiding students in solving problems that enhance financial knowledge during mathematics instruction

We believe that analyzing financial and economic exercises in general education school textbooks and tailoring teaching methods to the structure of each task is essential for fostering students' financial literacy.

Creative problems, real-life applications, and finance-related word problems in the school mathematics curriculum serve as useful tools for developing students' functional and financial literacy.

In countries such as Singapore, the Netherlands, Brazil, Australia, the United Kingdom, and the United States, special attention is given to preparing students for real-life challenges from an early age. When comparing mathematics textbooks from these countries with those used in grades 5 through 11 in Kazakhstan's general education schools, it becomes clear that financial and economic problem-solving tasks receive considerablely less highlighted is in the Kazakhstani curriculum.

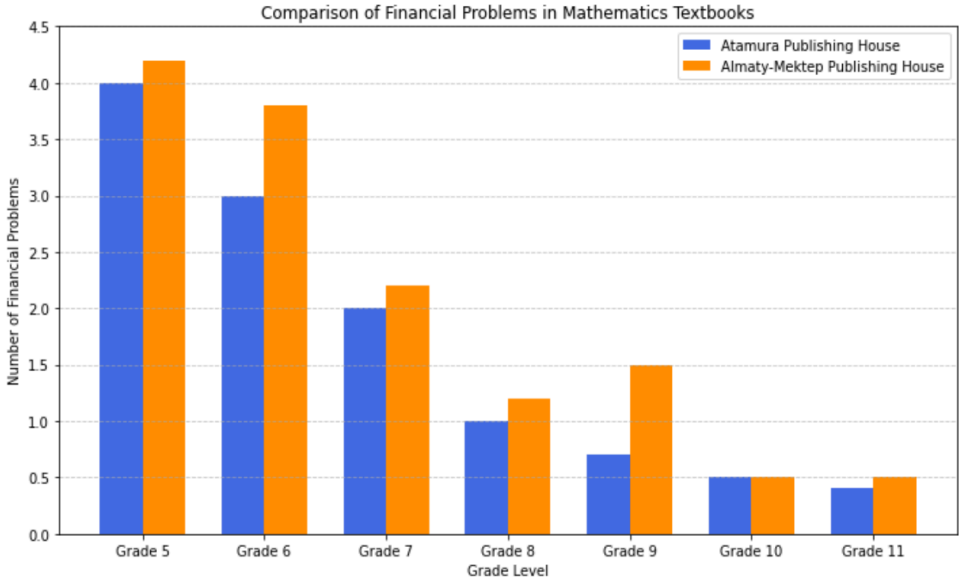
In the school course, mathematical tasks with practical and financial and econo - mic content, as well as tasks with elements of creativity, play an important role in the development of functional and financial literacy of students. By teaching schoolchildren to solve such tasks, it is possible to form key skills that will be useful in real life. The goals of methodical to formation of financial literacy through learning how to solve applied mathematical problems can be defined as follows: strengthening of the applied direction of mathematical knowledge through the inclusion of interdisciplinary assignments related to economics; development of intellectual abilities of students and to formation of economic thinking, necessary both for mathematical activity and for everyday life in society; formation of understanding of mathematical ideas and methods of their application for description and analysis of the surrounding world, as well as mastering of basic economic concepts; development of the idea of mathematics as a part of general human culture and awareness of its importance for social progress.

In accordance with the methodological system of teaching mathematics, it is possible to distinguish the structure of the approach to the formation of financial literacy through practical tasks: the factor of a external necessity — reflects the urgency of forming financial literacy among schoolchildren through the solution of tasks related to real monetary situations; an target component — includes the selection of training methods, an corresponding to educational goals and tasks, taking into account external conditions and requests of the society; the content component includes tasks from to school mathematics textbooks with financial content, as well as examples from a international studies, such as PISA and TIMSS; an procedural component — include the content of the mathematical course, methods and means of training, forms of organization of a lessons, methods and steps for learning the solution of practically - oriented tasks with a financial meaning; resultant component

— involves the assessment of students' knowledge and skills, the formation of criteria and performance indicators aim at checking well students have an mastered financial concepts through such tasks.

It was find that the textbooks published by "Atamura" and authored by K. Shyinybekov and others place greater an focus on complex mathematical problems, while them do not cover financial topics. In contrast, the textbooks published by "Mektep" under the authorship of A.E. Abilkassymova and others include more content related to financial problems(Figure 2.2.1).

Figure 2.2.1 The presence of financial and economic problems in general education mathematics textbooks



The textbooks published by Mektep under the authorship of A.E. Abilkassymova and colleagues include the following types of word problems:

- tasks aimed at developing students' ability to read and create economic tables, simple charts, and graphs;
- the textbooks as well include financial and economic tasks under themes such as "Mathematics in Business", "Mathematics in My Life," "Mathematics in Everyday Life" and "Mathematics in a Chef's Life" among others;
- there are exercises focused on arithmetic calculations and assignments presented under the title "Practice-Oriented Tasks".

Many of these tasks reflect real-life contexts commonly encountered in practice, such as labor productivity, product cost and other economic terms. Often, correct answers are find through numerical reasoning rather than a clear understanding of the economic terminology or specific phrases used in the text.

Assignments aimed at developing financial literacy are presented in two complex formats, each of which includes various aspects of functional literacy. In each version, two tasks focus on identifying financial information, two involve analyzing information in a financial context, another two are designed to assess

financial problems, and the final two require students to apply financial knowledge through cognitive engagement.

According to the PISA study, students' financial literacy is categorized into five proficiency levels:

- **Level 5 – Advanced (625 points):** Students at this level demonstrate a broad understanding of financial terms and concepts in contexts relevant to their lives over the long term. Them are able to analyze complex financial products and take into account subtle but important details in financial documents (such as transaction costs). Them solve non-routine financial an problems with high accuracy and describe possible outcomes of financial decisions. These students as well show strong understanding of the broader financial environment (e.g., income tax).

- **Level 4 – High (550 points):**

At this level, students understand a wide range of financial terms and contexts them may encounter as them grow older, such as managing a bank account. Them are able to interpret detailed financial documents (e.g., bank statements) and explain the purpose of moderately complex financial products.

- **Level 3 – Moderate (475 points):** Students show understanding of commonly used financial concepts and terms in personal contexts. Them begin to evaluate the consequences of financial decisions and can develop simple financial plans in familiar situations. Them can explain basic financial documents and perform standard numerical operations, including percentage calculations. Them are able to select appropriate strategies to solve everyday problems in typical financial contexts, such as budgeting.

- **Level 2 – Basic (400 points):** Students begin to apply their knowledge of basic financial products and frequently used financial terms. Them use available information to make financial decisions in situations that directly affect them, recognize the usefulness of simple budgets, and understand the key features of common financial documents.

- **Level 1 – Below Basic (Below 400 points):** Students can recognize basic financial products and situations. Them are able to interpret information related to basic financial concepts and distinguish between needs and wants.

Let us now turn our attention to financial and economic tasks that are connected to the topics covered in the school mathematics curriculum, as reflected in the international PISA assessments.

Task 1. There are four types of pastries sold in the school cafeteria (Table 2.2.1)

Table 2.2.1 Pastries available in the school cafeteria

Jam- filled Pastry	Potato- filled Pastry	Meat- filled Pastry	Cheese- filled Bun
350 tenge	400 tenge	450 tenge	380 tenge

Task 1: Marzhan decided to buy 2 meat-filled pastries, 3 jam- filled pastries, and 1 cheese- filled bun. She gave the cashier 5000 tenge.

How much change should Marzhan receive?

Task 2: Erkin was very hungry by the end of his reading day and went to the cafeteria to refresh himself. On the cafeteria table, he saw only 5 potato- filled pastries left. He had just 1500 tenge in his pocket. He placed the money on the table and asked for 3 pastries. Since the workday was over, the seller offered him all 5 pastries for that amount. What discount (in percentage) did Erkin receive on each pastry?

Task 3: There are 11 students in the 6th grade: 6 girls and 5 boys. The girls prefer sweet pastries, while the boys like meat-filled ones. Aidan wants to buy pastries for all his classmates and himself. But, it's known that only 3 jam - filled, 11 potato- filled, 5 meat - filled, and 6 cheese - filled pastries remain in the cafeteria. Aidan has 4450 tenge. How can Aidan ensure that everyone in the class gets a pastry, without leaving anyone out? What solution can he come up with and how can he implement it?

Solution – Task 1: Marzhan bought 2 meat-filled pastries at 450 tenge each: $2 \times 450 = 900$ tenge. She as well bought 3 jam-filled pastries at 350 tenge each: $3 \times 350 = 1{,}050$ tenge. And 1 cheese-filled bun for 380 tenge. The total cost of all items: $900 + 1050 + 380 = 2330$ tenge. Marzhan paid 5000 tenge ,so the change she should receive is: $5000 - 2330 = 2670$ tenge.

Answer: Marzhan should receive 2670 tenge in change.

Task 4. A pizzeria sells pizzas with the same thickness but different sizes. The smaller pizza has a diameter of 30 cm and costs 300 tenge,
while the larger pizza has a diameter of 40 cm and costs 400 tenge.

Question: Which pizza offers better value for money?

Solution: To determine which pizza is a better deal, we calculate the area of each pizza using the formula: $S = \pi \times R^2$. For the smaller pizza (diameter = 30 cm, radius = 15 cm):

$S = 3.14 \times 15^2 = 706.5$ cm²

Price per square centimeter: $300 \div 706.5 \approx 0.42$ tenge/cm².
For the larger pizza (diameter = 40 cm, radius = 20 cm):

$S = 3.14 \times 20^2 = 1256$ cm²

Price per square centimeter: $400 \div 1{,}256 \approx 0.31$ tenge/cm².

Answer: Its more cost-useful to buy the larger pizza, as it offers more value for the price.

Task 5. On Monday, Arman traveled 20 km through the city and drove 90 km to and from Kostanay. On Tuesday, he traveled 10 km through the city and 44 km to and from Taranovka. On Monday, Arman spent 830 tenge on fuel. On Tuesday, he spent 408 tenge on fuel(1 liter of gasoline costs 100 tenge).

Question 1: What was the average fuel consumption in the city and on the highway?

Question 2: Based on the data, identify which car Arman owns using Table 2.2.2.

Table 2.2.2 Vehicle Fuel Consumption

Car	Fuel consumption in the city (L/ 100 km)	Fuel consumption on the highway (L/ 100 km)
Audi A3	6.6 L / 100 km	4.3 L / 100 km
Hyundai i20	10.0 L / 100 km	7.0 L / 100 km
Kia Sportage	15.0 L / 100 km	10.0 L / 100 km
LADA Priora	9.8 L / 100 km	5.6 L / 100 km

Question 3: What is the ratio of the total city distance to the total highway distance over the two days?

Question 4: By what percentage is the car's fuel consumption in the city higher than on the highway?

Solution: Let's define the following: x – total fuel cost for city driving, y – total fuel cost for highway driving.

Table 2.2.3 below shows the distances traveled and fuel costs for each type of road:

Table 2.2.3 Car distances and fuel expenses

Day	City distance (km)	Highway distance (km)	Fuel cost (tenge)
Monday	20 km	90 km	830
Tuesday	10 km	44 km	408

1) $20x + 90y = 8.3$ and $10x + 44y = 4.08$ - the system if linear equations

Answer: $x = 0.1$, $y = 0.07$

2) To calculate the fuel consumption per 100 km: on the highway:

$100 \times 0.07 = 7$ liters per 100 km; in the city: $100 \times 0.10 = 10$ liters per 100 km.

3) $(20+10):(90+44) = 30:134$

4) 100% - 70% = 30%.

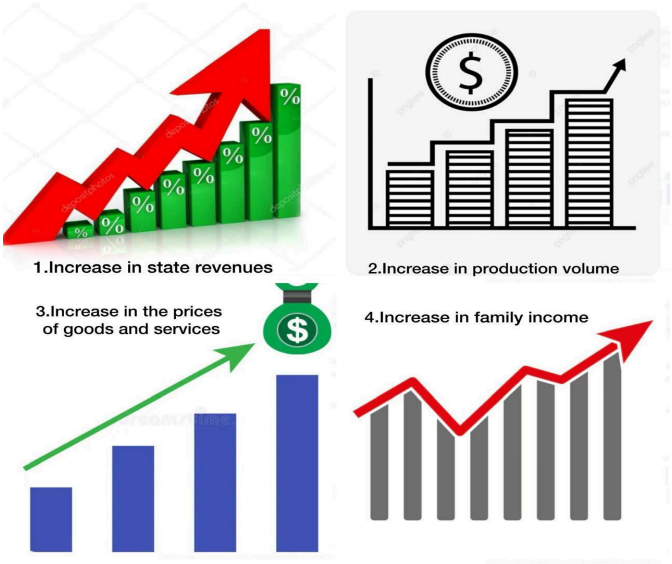
Answer: 1) 7 L, 10 L, 2) Hyundai i20, 3) 30 : 134, 4) 30%.

Task 6. On a television program about inflation, the host drew viewers' attention to the distinction between nominal and real income. Them explained that real income is affected by inflation and rising prices. The host mentioned that soon a chewing gum would cost 50 tenge, and the cheapest car would be 3 million tenge. Carefully examine the diagrams in Figure 2.2.2:

1. Increase in state revenues;
2. Increase in production volume;
3. Increase in the prices of goods and services;
4. Increase in family income.

Which of the following can be given as an example of inflation?

Figure 2.2.2 About Inflation



Solution: As a visual representation of inflation, diagram №3 can be presented, as it aligns with the definition of "inflation."

Based on the definition of inflation, "Inflation (from Latin inflatio – 'swelling') is a sustained increase in the general price level of goods and services over a period of time. During inflation, the same amount of money can purchase fewer goods and services than before. In this scenario, its said that the purchasing power of money has decreased over time, and money has depreciated – it has lost a portion of its real value. Goods and services become more expensive over time. Diagrams №1, №2, and №4 cannot be presented as examples because them do not correspond to the definition of inflation."

While explaining this problem, we focus on the concept of "expenses" and provide examples of family income and spending. Through this, we aim to develop students' financial literacy by helping them understand the importance of using money wisely and avoiding careless or unplanned spending.

Since the number of financial literacy problems are rarely found in standard mathematics textbooks, additional tasks were sourced from an external collection designed specifically to develop students' understanding of financial concepts (Motoro, Novozhilova, & Shalashova, 2019).This supplementary source provided a broader range of financial literacy problems suitable for middle school students.

Insurance Premium – the payment for insurance that the policyholder pays to the insurer in accordance with the terms of the insurance contract.

The insurance premium is calculated using the following formula:

$$\text{Insurance premium} = ST \times ST \times K,$$

where:

SS – the insured amount under the contract;

ST – the insurance rate (tariff);

K – various possible increasing or decreasing coefficients.

Task 7: The cost of the apartment is 33,200,000 tenge. The insured amount under the contract is 22,500,000 tenge. The insurance rate is 0.5%. Calculate the insurance premium.

Solution: We use the formula: Insurance Premium = SS × ST.
Where: SS = 22,500,000 tenge (insured amount) ST = 0.5% = 0.005 (insurance rate in decimal form).

Insurance Premium = 22,500,000 × 0.005 = 112,500 tenge.
Answer: Insurance premium = 112,500 tenge.

Insurance under the system of proportional liability means partial insurance of the object's value.
The amount of *insurance compensation* under this system is calculated using the following formula: B = S × U / C
Where:

B – the amount of insurance;

S – the insured amount under the contract;

U – the actual amount of damage;

C – the appraised value of the insured object.

Task 8: As a result of a flood, a country house was damaged. The insured amount under the insurance contract is 10,000,000 tenge.
The actual (market) value of the house is 4,500,000 tenge. The damage includes: Foundation — 20% damaged. Floor — 30% damaged. Note: According to the "Table of percentage values of individual structural parts relative to the total value of a building": The foundation represents 40% of the total value. The floor represents 15% of the total value. Determine the amount of insurance compensation.

Solution:

1.1 Foundation damage.
Value of foundation = 40% of 4,500,000 = 0.40 × 4,500,000 = 1,800,000 tenge.
Damage = 20% of 1,800,000 = 0.20 × 1,800,000 = 360,000 tenge.

1.2 Floor damage:
Value of floor = 15% of 4,500,000 = 0.15 × 4,500,000 = 675,000 tenge.
Damage = 30% of 675,000 = 0.30 × 675,000 = 202,500 tenge.
Total actual damage (U): 360,000 + 202,500 = 562,500 tenge.

Step 2: Calculate insurance compensation (B)
Using the formula: B = S × U / C
B = 10,000,000 × 562,500 / 4,500,000 = (10,000,000 ÷ 4,500,000) × 562,500
≈ 2.2222 × 562,500 ≈ 1,250,000 tenge
Answer: The amount of insurance compensation is a 1,250,000 tenge.

Investments are funds, securities, other assets (including property rights and other rights with monetary values) that are allocated into business and/or other

1. Investment Return = (Profit / Investment Amount) × 100%
2. Annual Return = (Profit / Investment Amount) × (12 / T) × 100%,

where T is the number of months over which the profit was earned.

3. Portfolio Return

The return on an investment portfolio is calculated as the weighted average of returns based on the proportion of funds invested in each asset:

$$R_p = \Sigma (W_i \times R_i),$$

where:

- R_p – portfolio return;
- W_i – proportion of funds invested in the *i*-th asset;
- R_i – return on the *i*-th asset.

Task 9: The dividend per share of the company Nickel is 571 tenge, while the dividend per share of the company Gold is 51 tenge higher. What total income will Mikhail, a shareholder of these companies, receive if his investment portfolio includes 7 shares of Nickel and 3 shares of Gold?

Solution: Dividend per share of Nickel = 571 tenge. Dividend per share of Gold = 571 + 51 = 622 tenge. Mikhail owns: 7 shares of Nickel, 3 shares of Gold.

Income from Nickel = 7 × 571 = 3,997 tenge;

Income from Gold = 3 × 622 = 1,866 tenge;

Total income = 3,997 + 1,866 = 5,863 tenge

Answer: Total income = 3,997 + 1,866 = 5,863 tenge.

Pension savings are the funds from which funded (accumulative) pension is formed. The Individual Pension Coefficient (IPC) (number of pension points) for a year is calculated using the following formula:

$$IPC = AnnualIncome / ContributionBase \times 10$$

Where:

IPC – Individual Pension Coefficient (number of pension points);

AnnualIncome – the individual's annual income subject to pension contributions;

ContributionBase – the maximum income subject to contributions (as defined by law);

AnnualIncome – the total amount of income earned by the insured person during the year;

ContributionBase – the maximum taxable base, the amount of which is set annually by law.

The amount of the insurance pension upon retirement at the legals retirement age is calculated using the following formula:

$$IP = IPC \times SIPC + FV$$

Where: IP – Insurance Pension; IPC – total number of pension points (Individual Pension Coefficient) accumulated by to the time the pension is granted; SIPC – the value of one pension point on the date of pension assignment; FV – the fixed part of the insurance pension.

The amount of the insurance pension upon retirement after a certain period following the legal retirement age is calculated using the formula:

$$IP = IPC \times K_1 \times SIPC + FV \times K_2$$

Where: IP – Insurance Pension; IPC – total number of pension points accumulated by the time the pension is granted; SIPC – the value of one pension point on the date of pension assignment; FV – the fixed part of the insurance pension; K_1 – bonus coefficient for the pension portion; K_2 – bonus coefficient for the fixed part of the pension.

Task 10: In 2018, Arman's grandfather applied for an insurance pension upon reaching the retirement age. His insurance work experience is 38 years. The total number of pension points (IPC) earned over his career is 210 points. The value of one pension point in 2018 is 14,250 tenge. The fixed payment component of the insurance pension is 427,500 tenge. Determine the total amount of his insurance pension.

Solution: Formula:

Insurance Pension = IPC × ValuePerPoint + FixedAmount.

IPC = 210, ValuePerPoint = 14,250 tenge,

FixedAmount = 427,500 tenge.

Step 1: Calculate the variable part of the pension 210 × 14,250 = 2,992,500 tenge

Step 2: Add the fixed part 2,992,500 + 427,500 = 3,420,000 tenge.

Answer: Arman's grandfather will receive an insurance pension of 3,420,000 t

The *future value of a uniform stream of contributions* (second banking problem) is calculated using the following formula:

$$FV = R \times ((1 + \frac{i}{m})^{n \times m} - 1) \times \frac{m}{i}$$

Where: FV – the future value of the accumulated amount; i – the annual interest rate (expressed as a decimal); n – the investment term in years; R – the amount of each contribution made per compounding period; m – the number of compounding periods per year (e.g., 365 for daily, 12 for monthly).

Task 11: Aizere plans to save money for her child's university education. She decides to deposit 100,000 tenge every month into a special savings account that offers an annual interest rate of 9%, compounded monthly. She plans to continue these monthly deposits for 10 years.

Question: How much money will Aisulu have saved in the account at the end of the 10 years?

Solution: We will use the Future Value of an Ordinary Annuity formula. Given: R = 100,000 tenge; i = 0.09 (9% annual interest rate); n = 10 years; m = 12 (monthly compounding). Then substitute all values into the formula.

Finally we will get an approximate value of FV ≈ 100,000 × 179.853 ≈ 17,985,300 tenge.

Answer: 17,985,300 tenge.

Task 12: A family decided to save money for a car. To do this, they deposited 1,600,000 tenge in the bank each year on the same day at the beginning of the year for four years at an interest rate of 7% per annum (compounded annually).
What will be the total accumulated amount after 4 years?

Solution: We use the formula for the future value of an ordinary annuity (since the deposits are made at the beginning of each year):

$$FV = R \times \left(\frac{(1 + i^n) - 1}{i}\right)$$

Given: R =1, 600, 000 tenge — annual deposit, i = 0.07 — annual interest rate, n = 4 number of years. Then substitute all values into the formula.
Finally we will get a FV = 7,103,840 tenge.

Answer: The total accumulated amount after 4 years is approximately 7,103,840 tenge.

A *bond* is a security issued through a public offering that gives its holder the right to receive the face (nominal) value or an equivalent in assets from the bond issuer within the time frame specified in the bond. In accordance with the bond's terms, the holder may also be entitled to interest payments or other property rights. Bond income can come in the form of interest or a discount.

Yield to Maturity Formula for a Zero-Coupon Bond (Discount Bond):

$$D_y = \left(\sqrt[n]{\frac{N}{P}} - 1\right) \times 100\%$$

Where:

D_y – yield to maturity (expressed as a percentage);

n – number of years to maturity;

N – face (nominal) value of the bond;

P – market (purchase) price of the bond.

Task 13: Sergey's uncle purchased a zero-coupon bond with a face value of 50,000 tenge for 41,322.3 tenge. The bond matures in 2 years.

What is the annual yield to maturity (YTM) if he holds the bond until maturity?

Solution:
Given: N = 50,000 — nominal (face) value of the bond; P = 41,322.3 — purchase (market) price; n = 2 — years to maturity.

$D_y = (\sqrt{(50,000 : 41,322.3)} - 1) \times 100\% = (1.2098) - 1) \times 100\% = (1.0999 - 1) \times 100\% \approx 9.99\%$

Answer: $D_y \approx 9.99\%$.

Inflation is the rate at which the general level of prices for goods and the services rises over a period of time in an economy, leading to a decrease in the purchasing power of money. It is usually measured annually and expressed as a percentage.

The inflation index over n years is calculated :

$$j=(1+i_1)(1+i_2)\cdots(1+i_n)$$

- j – inflation index;
- $i_1, i_2, \ldots, i_n$ – the inflation rates (expressed as decimals) for the 1st, 2nd, ..., nth year.

Task 14: The inflation rates over five consecutive years are as follows: Year 1: 5%; Year 2: 6%Year 3: 4.5%; Year 4: 7%; Year 5: 3.5%. Calculate the inflation index over these 5 years.

Solution: $j = (1+i_1)\times(1+i_2) \times (1+i_3) \times (1+i_4) \times (1+i_5)$

$$j = (1.05) \times (1.06) \times (1.045) \times (1.07) \times (1.035) = 1.286$$

Answer: The inflation index over 5 years is approximately 1.286. This means that prices increased by about 28.6% over the 5-year period.

Task 15: Given: Initial loan: 1,000,000 tenge. At the end of Year 1, the borrower pays 660,000 tenge (after interest is added). At the end of Year 2, the borrower pays 484,000 tenge and fully a repays the loan. The interest rate is compounded annually at rate r.

Solution: Step 1:

After Year 1

Let r be the annual interest rate (expressed as a decimal, e.g., 0.1 for 10%). After one year, the loan grows due to interest:

Loan after Year 1=1,000,000 · (1+r)

Then the borrower pays 660,000 tenge:

Remaining debt = 1,000,000(1+r) − 660,000

Step 2: After Year 2

The remaining debt from above grows again by interest:

(1,000,000(1+r) − 660,000)(1+r) = 484,000

Now expand and solve this equation:

(1,000,000(1+r) − 660,000)(1+r) = 484,000

Distribute: $1{,}000{,}000(1+r)^2 - 660{,}000(1+r) = 484{,}000$

Let's denote x = 1 + r, then:

$$x^2 - 660{,}000x - 484{,}000 = 0$$

$$x^2 - 0.66x - 0.484=0$$

$$x^2 - 0.66x - 0.484 = 0$$

$$x^2 -0.66x - 0.484 = 0,\ D = 2.3$$

$$x_{1,2} = \frac{-(-0.66) \pm \sqrt{2.3}}{2} = \frac{0.66 \pm 1.532}{2}$$

Answer: Choose the positive root (since interest is positive): x = 1.0995 . Recall x = 1 + r, so: r = x − 1 = 1.0995. The annual interest rate charged by the bank is approximately 9.95%.

So, teaching students to solve financial and economic problems in mathematics lessons helps develop computational skills based on financial concepts such as taxes,

deposits, loans, margins, and discounts. By working on financial and economic word problems, students can build their financial literacy in the following ways:

- describing and identifying types of human needs with real-life examples;
- recognizing economic phenomena and processes in society;
- completing basic practical tasks related to analyzing personal financial situations;
- understanding the impact of inflation on everyday life;
- applying methods to analyze consumer price indices;
- analyzing simple real-life scenarios related to personal finance, civic duties, and labor relations;
- explaining the problem of limited financial resources;
- identifying and describing types of taxes through examples;
- distinguishing between different forms of money and their uses;
- describing household finances and analyzing family budgets;
- setting financial goals and evaluating their feasibility;
- managing and saving money wisely in daily life;
- understanding the functions of the banking system;
- distinguishing types of loans and understanding how loans are problem;
- using credit cards and conducting bank transactions competently; being able to protect themselves from fraud in financial matters.

The level of performance of students' tasks within the framework of the international study PISA is evaluated according to the following criteria: knowledge (reproduction of information, mastery of a facts and ability to answer an simple questions), application (ability to establish connections, use concepts), and discussion (reflection). In the updated content of school education, a level of mental activity of schoolchildren is also estimated on the basis of a Bloom's taxonomy, which include levels: knowledge, understanding, application, analysis, synthesis and evaluation.

Accordingly, the formation of financial literacy of students through training in solving applied tasks can be estimated as follows: Level A — knowledge and understanding: the student is able to correctly to solve mathematical tasks with financial and economic content; understands an information presented in mathematical language; an able to translate tasks into mathematical form, read and interpret schemes, graphs, diagrams. Level B — application and analysis: a student can choose the most appropriate way to solve the task of a financial nature, apply knowledge from different a topics, and not only what has been studied; can checks the correctness of the answer, argues mathematical reasoning and conclusion. Level C — synthesis and evaluation: able to prepare and defend a report or abstract on the topic, participate in research a projects; know how to a plan a solution to a problem, use a wide range of knowledge and draw reasonable conclusions; uses various methods of presenting mathematical information using modern technologies.

Thus, learning how to solve tasks with financial and economic content in mathematics lessons helps to students to develop computational skills related to such concepts as taxes, deposits, credits, margins, and discounts. This allows not only to develop mathematical thinking, but also prepares students for real life situations.

At the end of the lesson, assessment will be conducted using the "Peak of Knowledge" method. Students' acquired knowledge and learning achievements will be evaluated through a criterion-based assessment system. Unlike traditional assessment, this system focuses on collecting to information about students' academic progress and the quality of their knowledge based on specific topics and units.

3. RESULTS

3.1 Pedagogical experiment focused on developing school students' financial literacy and analysis of its results

In accordance with the research objectives, subject, and hypothesis, a pedagogical experiment was conduct to determine the effectiveness of a methodology aimed at developing students' financial literacy through solving financial and economic problems.

The pedagogical experiment was organized during the years 2023–2025 in the following stages, in line with the research goals and tasks:

- Diagnostic (ascertaining) experiment (2023–2024);
- Formative experiment (2024–2025);
- Summative (control) experiment (2024–2025).

Research base: The pedagogical experiment was conduct with 9th- grade students at the municipal public school "Secondary School № 129" under the Department of Education of Almaty city. During the research, tasks with financial and economic content was aimed at developing students' financial literacy by applying their mathematical knowledge in practice.

The questionnaire used in this study was based on a set of statements originally published in a peer - reviewed article focused on evaluating students' financial literacy. The questions was adapted to suit the age and context of middle school students and was designed to assess attitudes and behaviors related to money management, such as planning expenses, saving habits, and the perceived importance of financial decisions.

The questionnaire items used in this dissertation survey were adapted from the study by Syahputra et al. (2019), which explored students' financial literacy through contextual mathematics learning. The data were collected through a voluntary survey involving 92 eighth-grade students from municipal public school "Secondary School № 129" under the Department of Education of Almaty city. The Financial Attitudes Questionnaire includes 13 statements aimed at assessing students' attitudes towards financial matters, including their confidence in budgeting, propensity to save, and consumer behaviour. The reliability of the questionnaire and tests was confirmed: the reliability coefficients were 0.705 and 0.651, respectively. The collected data were analyzed to describe the level of students' financial literacy, including aspects such as knowledge, practical skills, and attitudes towards finance. The results of the financial knowledge and skills tests were converted to a 100-point scale, after which they were assessed according to the minimum threshold of 75 points. Eighth grade students took part in the survey, in which they evaluated 13 statements using a five-point a Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). The data collected offered valuable insights into students' attitudes and behaviors related to financial decision - making in their a daily lives (Table 3.1.1).

Table 3.1.1 Survey Results – Percentage of Responses per Question

Question	1 – Answer %	2 – Answer %	3 – Answer %	4 – Answer %	5 – Answer %
Q1	0.0%	0.0%	25.0%	62.5%	12.5%
Q2	12.5%	0.0%	50.0%	12.5%	25.0%
Q3	0.0%	0.0%	50.0%	12.5%	37.5%
Q4	12.5%	0.0%	12.5%	37.5%	37.5%
Q5	0.0%	0.0%	50.0%	37.5%	12.5%
Q6	12.5%	12.5%	12.5%	50.0%	12.5%
Q7	12.5%	50.0%	12.5%	12.5%	12.5%
Q8	0.0%	12.5%	37.5%	50.0%	0.0%
Q9	12.5%	12.5%	25.0%	37.5%	12.5%
Q10	0.0%	37.5%	37.5%	12.5%	12.5%
Q11	0.0%	0.0%	25.0%	50.0%	25.0%
Q12	12.5%	25.0%	25.0%	37.5%	0.0%
Q13	0.0%	25.0%	25.0%	37.5%	12.5%

Based on the analysis of the responses:

More than 60% of students chose level 4 or 5 on statements pertaining to budgeting and saving, indicating that they agreed with the significance of financial planning.

- Conversely, claims about refraining from impulsive purchases or being. The distribution of students who were cautious when making financial decisions was more varied, with some choosing lower agreement levels.
- Question 2 ("I feel more relaxed when I save some money"), for instance, had a 50% agreement level but a 12.5% disagreement level, indicating that people's saving habits vary from person to person.
- A growing awareness of the financial responsibility was indicated by statements that addressed a real - life financial scenarios, such as differentiating between needs and wants or making plans with a limited resources. These statements tended to show higher agreement.

According to this data, students still need to improve their consistency in their financial behavior even though they generally understand an importance of money and saving. These results highlight how crucial its to incorporate scenario-based, practical financial education into math classes in order to develop students' ability make decisions in the real world as well as their computational skills.

Summative Assessment Task No. 1 was given at the beginning of the experiment to ascertain the students' foundational understanding of how solve financial - context problems. The experiment involved 108 students in total.

At the initial stage of an experiment, Summative Assessment Task No. 1 was administered to determine students' baseline knowledge in solving financial-context problems. A total of 108 students participated in the experiment. The participants was randomly divided into an Experimental Group (EG) of 53 students and Control Group (CG) of 55 students. To assess their initial knowledge levels, both groups was given

the same tasks from Summative Assessment No. 1 (Appendix). The results of this assessment at the beginning of the experiment are presented in Table 3.1.2.

Table 3.1.2 Results of the first summative assessment task

Grade	Number of students	100-90	89-75	74-50	49-0	Quality of education (%)	Academic performance (%)
Grade 8							
EG	53	13	13	25	2	49,1%	96,2
CG	55	14	14	27	0	50,9%	100,00

For the Experimental Group, applied financial-economic content - based problems was used, and the lessons was conduct according to the designed plans without deviation. In contrast, the lessons for the Control Group was taught using traditional methods as planned. To assess the effectiveness of the methodology for developing financial literacy through mathematics education, Summative Assessment No. 2 was administered to the 8th-grade students, and their mathematical knowledge levels was determined accordingly (Appendix). The results of the Summative Assessment No. 2 for the Control Experiment are shown in Table 3.1.3.

Table 3.1.3 Results of the second summative assessment task

Grade	Number of students	100-90	89-75	74-50	49-0	Quality of educati-on (%)	Academic performance (%)
Grade 8							
EG	52	16	16	20	0	61,5%	100,0
CG	50	12	14	23	1	52%	98,00

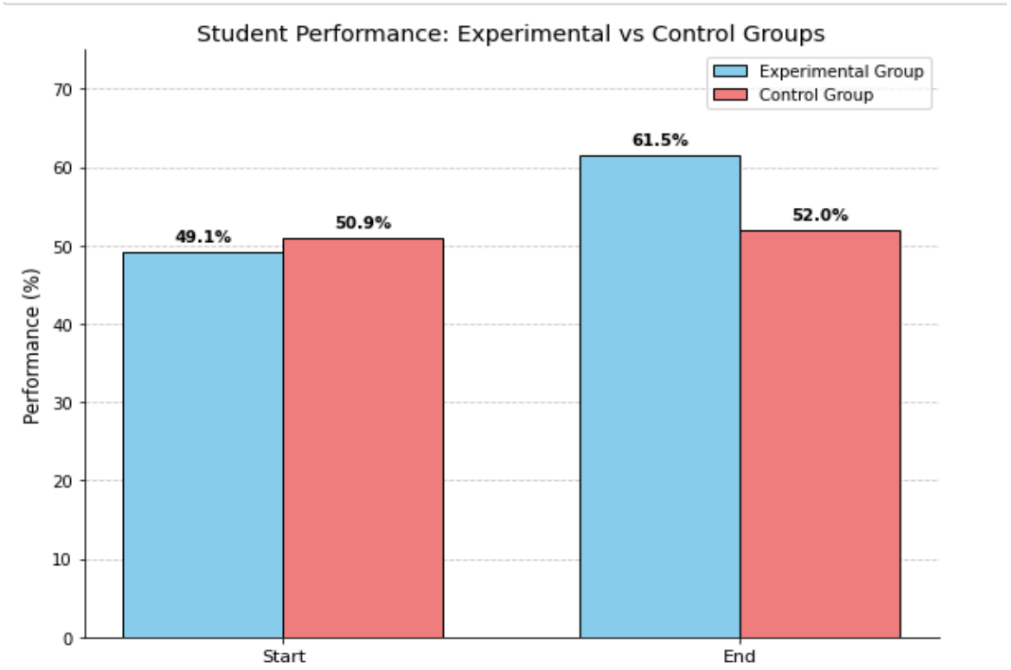
A total of 102 students participated in the observational experiment, with 52 students in the Experimental Group and 50 students in the Control Group. To evaluate the effectiveness of the proposed methodology, an analysis was conduct on summative assessment tasks designed for 8th-grade students. These tasks was based on the mathematics curriculum and aimed at developing financial literacy through financial - economic problem - solving.

Analysis of the academic results from both the experimental (EG) and control (CG) groups led to the following conclusions:

- Students in the EG demonstrated a solid findation in financial-economic knowledge and skills.
- EG students exhibited a higher proficiency in essential mathematical skills necessary for solving financial-economic problems.

Through solving financial-economic problems, EG students developed financial literacy skills and was capable of tackling real-life mathematical word problems.

Figure 3.1.1 The level of formation of financial literacy of 8th grade students through solving financial-economic content problems



Student performance on these assessments was measured using predefined criteria. The outcomes of the second summative assessment was evaluated using descriptors, and the percentage of students mastering financial competencies was illustrated in a diagram (Figure 3.1.1).

Table 3.1.4 Levels of Financial Literacy development

Group	Formation level
Control Group (55 students)	52%
Experimental Group (53 students)	61,5%

According to the statistical criterion, a Z-test for two proportions was applied (Figure 3.1.4).

Two research hypotheses was formulated:

Null hypothesis (H_0): There is no significant difference in the level of financial literacy development between students in the experimental and control groups through solving financial and economic problems in mathematics lessons.

Alternative hypothesis (H_1): There is a significant difference in the level of financial literacy development between students in the experimental and control groups through solving financial and economic problems in mathematics lessons.

Based on the results of the Z-test for two proportions, the p-value get is less than 0.05 (0.0493 < 0.05). This shows that the observed difference between the experimental and control groups is statistically significant.

Figure 3.1.2 Statistical significance of the financial literacy intervention

```
|: from statsmodels.stats.proportion import proportions_ztest

success = [35, 26]
nobs = [53, 55]
z_stat, p_value = proportions_ztest(success, nobs)

print(f"Z-statistic = {z_stat:.3f}")
print(f"P-value = {p_value:.4f}")
```

```
Z-statistic = 1.966
P-value = 0.0493
```

Given this result, we do not reject the null hypothesis but instead accept the research hypothesis. This suggests that the teaching method, incorporating tasks and pedagogical techniques aimed at developing financial literacy, has had a significant positive impact on the students' level of financial literacy. In other words, the hypothesis that the students exposed to this method would improve their life- and practice-oriented competencies is supported by the statistical analysis.

This result provides evidence that the experimental intervention (focused on financial literacy) likely contributed to improved outcomes, thus confirming the effectiveness of this pedagogical approach.

1. Based on the methodological system of teaching mathematics, the formation of students' financial literacy in mathematics education consists of five components: the goals, content, methods, tools, and forms of organization of instruction. The methodology is grounded in key didactic principles such as scientific accuracy, consistency, continuity, real-life relevance, creativity, and integration, along with the rules for their implementation.

To foster students' financial literacy, methodological approaches in organizing the mathematics teaching process include the competency-based, practice-oriented, system-activity, communicative, integrative, and research approaches. Additionally, various teaching methods such as explanation, discussion, visual aids, hands-on activities, differentiated instruction, problem-based, project-based, and active learning are recommended, along with interdisciplinary connections, modeling, and the use of information and communication technologies.

2.One of the main issues in the methodology of teaching mathematics is training students to solve problems. According to the analysis of methodological findations in this direction, teaching students to solve financial and economic problems includes goal-oriented, content-related, procedural, and outcome-based components.

The analysis of existing school mathematics textbooks shows that at all grade levels, it is possible to integrate mathematics with financial education. To support the development of students' financial literacy, creative assignments are

proposed—such as problems with financial-economic content and practice-oriented tasks. These tasks help students understand real-life economic concepts and apply their knowledge and to skills effectively in everyday situations.

3.The effectiveness of the developed methodology and teaching materials aimed at forming students' financial literacy in the process of learning mathematics has been experimentally tested and confirmed.

CONCLUSION

One of the most useful strategies for fostering a competitive and well-rounded individual lies in the systematic refinement of subject-specific curricula and instructional methodologies across all levels of education. Within the framework of mathematics education, the incorporation of financial and economic problem - solving tasks has emerged as a powerful tool for cultivating students' financial literacy. This pedagogical approach aligns with contemporary societal demands and contributes meaningfully to the formation of individuals equipped to navigate real-life economic challenges.

The relevance of financial literacy in school education is underscored by its direct connection to students' future engagement in socio - economic and professional contexts. Understanding the underlying mechanisms of economic relations enhances not only their academic competence but as well their ability to make informed decisions in their personal and professional lives.

The conduct dissertation research has both theoretical and experimental character. A fully analysis was carried out on pedagogical - psychological, didactic - methodological, and popular scientific literature, and the following tasks was undertaken:

1) The research examined both theoretical and practical foundations for developing students' financial literacy within the context of general secondary education. The analysis of the current situation revealed that students' level of financial literacy remains insufficient and does not fully meet the expected standards of mathematical preparedness.
2) A thorough review of domestic and international scholarly works was conduct, including a critical analysis of varying interpretations of financial literacy in the fields of pedagogy and educational research. Based on this, the conceptual boundaries and definitions of "financial literacy" and "mathematical financial literacy" was clarified and systematically distinguished. Special attention was given to identifying subtypes of financial literacy and examining their educational significance and interdisciplinary relevance.
3) The research explored how financial topics can be usefully integrated into mathematics education and assessed how finance - related content is currently represented in national educational standards. Findings revealed that such content is still insufficiently developed, pointing to the need for its broader inclusion to support students in building essential financial competencies.
4) To establish a sound methodological approach for incorporating financial elements into school mathematics, the study examined theoretical literature on mathematics education. A detailed review of the school textbooks was carried out to evaluate a extent and quality of financial examples. Based on these findings, practical suggestions was formulated to help educators introduce financial themes in a meaningful and instructionally sound manner.
5) A fully methodology was designed to enhance students' financial literacy through mathematics instruction. This framework includes clearly defined

learning goals, relevant thematic content, teaching strategies, instructional tools, and organizational formats. Core pedagogical and didactic principles was articulated to ensure the structured implementation of financial education within the mathematics curriculum.The proposed methodology, along with specially developed teaching materials, was tested in a real classroom environment. The outcomes demonstrated its usefulness in were improvededing students' grasp of financial concepts and their ability to apply mathematical reasoning to everyday financial decisions.

In light of the study's outcomes, the following recommendations are offered: mathematics teaching at the secondary level should deliberately incorporate cross-curricular connections with economic topics, making the application of mathematical knowledge to financial contexts more visible and relatable for students; the developed methodological approach can be usefully employed by school mathematics teachers to promote students' financial awareness and encourage responsible financial behavior, thereby fostering long-term financial competence; this research contributes to the growing field of financial literacy education by embedding essential financial knowledge into school curricula, equipping students with practical skills such as budgeting, saving, credit awareness, and informed financial decision-making; future research should consider to the broader impact of financial literacy education on students' personal progress, career readiness, and creative thinking. Such exploration is vital to prepare future generations to navigate complex financial realities with confidence, critical awareness, and responsibility.

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APPENDIX

Appendix 1.Attitude test

Бұл анкета анонимді және зерттеу тобынан басқа ешкімге көрсетілмейді. Барлық ақпарат құпия түрде сақталады және де ғылыми-зерттеу жұмысы үшін қолданылады.

Жынысы: Ер _____ Қыз _____

1-толықтай келіспеймін, 2-келіспеймін, 3-бейтарап, 4-келісемін, 5-толықтай келісемін

№	Сұрақтар	1	2	3	4	5
1	Қалтапұлды (ұсақ-түйек шығынға жұмсалатын ақша) жұмсауды жоспарлау маңызды іс. / Spending pocket money (used for small everyday expenses) wisely is an important task.					
2	Менде жинақтарым болғанда, өзімді жайлы сезінемін./ When I has savings, I feel comfortable.					
3	Егер менде артық қалтапұл (ұсақ-түйек шығынға жұмсалатын ақша) қалса, мен оларды сақтап қоямын. / If I has extra pocket money (used for small everyday expenses), I save it.					
4	Шығындарды жазу маңызды емес. / It is not important to record expenses.					
5	Мен үшін сатып алынатын заттар туралы мүмкіндігінше көп ақпарат іздеу - маңызды./ For me, it is important to search for as much information as possible about the items I plan to buy.					
6	Сатып алу алдында мен өз қаржымды ескеремін. / Before making a purchase, I consider my finances.					
7	Маған жинақ жасау маңызды емес. / Saving isn't important to me.					
8	Мен жоқтан гөрі аздап жинағанды жөн көремін. / I prefer saving a little rather than nothing.					
9	Мен сатып алу кезінде заттың бағасын ескеремін. / When making a purchase, I take the price of the item into account.					
10	Сатып алатын заттар туралы ақпарат іздеу тек уақытты босқа кетіреді. / Searching for information about things to buy is just a waste of time.					

11	Менің жинақтарым кейін пайдалы болады деп сенемін. / I believe that my savings will be useful later.					
12	Қалтапұл (ұсақ-түйек шығынға жұмсалатын ақша) шынымен жұмсалуы қажет. / Pocket money (funds for small everyday expenses) really needs to be spent.					
13	Мен үшін қаржымды басқару маңызды, сонда шығындар қалтапұлдан аспайды. / Managing my money is important to me so that my expenses don’t exceed my pocket money.					

Appendix 2.Practice tasks

Tasks for Summative Assessment No. 1 for Grade 8:

1. At the beginning of the year, the price of rice increased twice: first by 15%, and then by 30%. By what percentage did the price of rice increase overall throughout the year?
2. A total of 36 kg of apples and pears was sold. If it is known that the price of apples is 2.5 times lower than the price of pears, determine how many kilograms of each fruit was sold.
3. At the beginning of the year, the price of flour increased twice: first by 15%, and then by 30%. By what percentage did the price increase from the beginning of the year?
4. The selling price of a product per kilogram is 2,400 tenge, and the grocery store earns a 12% profit on it. If the store sells this product at a discounted price of 2,000 tenge per kilogram, it incurs a loss of 50,000 tenge. How many kilograms of this product did the store has in stock?

Assessment Criteria and descriptors for Summative Assessment No. 1 focused on developing financial literacy for Grade 8 students

Maximum score: 12 points

Assessment Criterion	№	Descriptor	Score
Calculates percentages	1	Forms an equation to find the discount according to the problem condition	1
		Finds the percentage of discount and calculates the final answer	1
Solves equations	2	Forms an equation according to the problem condition	1
		Finds the kilograms of apples and pears from the equation	1
Solves percentage-related financial problems	3	Solves a percentage problem using proportions	1
		Describes the process of finding the percentage of a number	1
		Knows the rules for calculating the percentage of a number	1
		Finds the answer according to the problem condition	1

Solves a financial problem using proportions	4	Finds the quantity of goods based on the condition	1
		Forms an expression for the 50,000 tenge loss when selling at 2,000 tenge per kg	1
		Forms a proportion based on the condition	1
		Forms an equation from the proportion, solves it, and finds the answer	1

Appendix 2.Practice tasks

Tasks for Summative Assessment No. 2 for Grade 8:

1. In what ratio should two types of tea be mixed—one costing 5,600 tenge per kilogram and the other 3,600 tenge per kilogram—so that the resulting mixture costs exactly 4,800 tenge per kilogram?
2. Income tax is 13% of the salary. After the income tax was deducted, Aigerim received 97,000 tenge. What was her gross monthly salary?
3. After two consecutive increases, the salary became 1.43 times higher. The second increase was three times greater (in percentage) than the first. By what percentage was the salary increased the second time?

Assessment Criteria and descriptors for Summative Assessment No. 2 focused on developing financial literacy for Grade 8 students

Maximum score: 12 points

Assessment Criteria	Task No.	Descriptor	Score
Solves equations	1	Forms an equation with two variables based on the task condition	1
		Finds the ratio of tea mixtures from the equation	1
Calculates income tax from word problems	2	Determines the value after applying the percentage of income tax	1
		Finds a number based on a given percentage	1
		Finds the correct solution of the problem	1
Solves word problems using quadratic equations	3	Forms the correct formula for the unknown percentage	1
		Substitutes unknown values according to the problem	1
		Constructs a quadratic equation	1
		Chooses a method to solve the quadratic equation	1
		Finds the root of the quadratic equation	1
		Applies the find value in the percentage formula	1
		Finds the final answer according to the problem condition	1

Appendix 3.Implementation act

APPROVED
Director of the Municipal State Institution
"Secondary School №129" of the Almaty city
Department of Education
A.S. Mukhametzhanov
02 05 2025

IMPLEMENTATION ACT

This is to certify that the research work titled **"Methodology for improving the financial literacy of students in the process of teaching mathematics"** by Moldir Nurzatkyzy Mazhit, a master's student of the educational program "7M01501 - Mathematics" at Suleyman Demirel University, was implemented in the educational process of the 2024–2025 academic year at the municipal state institution "Secondary School № 129" under the Department of Education of Almaty city, and that an experiment was conducted among students.

Vice Principal for Academic Affairs