

Financial Literacy and Financial Capability: Interdependence of Concepts and Possibilities to Form Them in a School Course of Mathematics

Alfabetización y capacidad financiera: Interdependencia de los conceptos y posibilidades de formarlos en un curso escolar de matemáticas

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Summary

Financial literacy and financial capacity of schoolchildren should be developed to meet the requirements of the rapidly developing society and increasingly complicated financial system of the Russian Federation. The authors focused on the financial education of schoolchildren who represent a special target group in financial relations. The main research methods were general scientific methods of cognition: systematization of theoretical and practical material, induction, deduction, comparative analysis, and synthesis. The authors defined the concepts of “financial literacy” and “financial capacity” and substantiated their interdependence using a synergistic approach. The authors considered school math course as a special tool for the formation of financial literacy and financial capacity of schoolchildren, explored the possibility of their development among Russian students in grades 7–9 in the course of algebra, stated the main problems, and formulated conclusions and recommendations.

Keywords: Financial Literacy; Financial Capability; Mathematics Education; Students; Competencies.

Resumen

Se deben desarrollar los conocimientos financieros y la capacidad financiera de los escolares para satisfacer las necesidades de la sociedad en rápido desarrollo y el sistema financiero cada vez más complicado de la Federación de Rusia. Los autores se centraron en la educación financiera de los escolares, que representan un grupo destinatario especial en las relaciones financieras. Los principales métodos de investigación fueron los métodos científicos generales de cognición: sistematización de material teórico y práctico, inducción, deducción, análisis comparativo y síntesis. Los autores definieron los conceptos de "alfabetización financiera" y "capacidad financiera" y comprobaron su interdependencia mediante un enfoque sinérgico. Los autores consideraron que el curso de matemáticas escolares era un instrumento especial para la formación de los conocimientos financieros y la capacidad financiera de los escolares, exploraron la posibilidad de su desarrollo entre los estudiantes rusos de los grados 7 a 9 en el curso de álgebra, expusieron los principales problemas y formularon conclusiones y recomendaciones.

Palabras clave: Conocimientos financieros; Capacidad financiera; Educación matemática; Estudiantes; Competencias.

Introduction

The rapid development of society, the accompanying changes in all areas of life, and the objective complication of the financial systems all over the world determine the significance of financial literacy and financial capability for all people. Explaining the importance of solving this problem for the whole society and for each individual, the Vice Chair of the US President’s Advisory Council on Financial Literacy, John Bryant claims that financial culture “has become another vital element in the system of skills and behavior rules. Financial literacy allows a person not to be dependent on circumstances, the will of other people, or the system. An educated person himself can choose the paths in life that will be most attractive to him, creating the material basis for the further development of society” (Zelentsova, Bliskavka and Demidov, 2012; Caplinska & Ohotina, 2019; Abd & Behadili, 2019).

Currently, over sixty countries of the world which have recognized the need to increase the financial culture of their people have launched various national projects and strategies for financial education or are already implementing some.

Financial literacy influences a person's financial behavior, which in turn determines the quality of his life. The Russian Federation considers increasing financial literacy a priority of the state policy, which is reflected in the main documents: the Concept of the National Program for Improving the Financial Literacy of the Population, the Concept of Long-Term Socio-Economic Development of the Russian Federation up to 2020, the Strategies for the Development of the Financial Market of the Russian Federation up to 2020, the National Draft of the Russian Federation Ministry of Finance (hereinafter – the Ministry of Finance), “Promoting Financial Literacy and Financial Education in the Russian Federation.” These documents state that the sustainable development of the modern market economy in Russia requires the introduction of more efficient production and financial technologies. In addition to this, population should be able to use them competently. In this regard, the strategic task is to develop the financial literacy of the younger generation.

A comparative analysis of international and Russian studies in various scientific fields (education, economics, sociology, and psychology) connected with the research topic and, in particular, the focus of the education system on the issues of personal finances (hereinafter – financial education), allowed us to put forward the hypothesis that school education is the optimal period for the formation of financial literacy, which can be explained by several reasons:

- it is possible to address all children, the whole generation, and teach them basic financial knowledge and attitudes representing the elements of financial culture, financial behavior, as well as to create conditions for further education in this area;
- children start to make independent financial decisions at a younger age, which means a larger number of transactions from simple spending of pocket money to schoolchildren setting up their own business.

Thus, the Russian school should provide high-quality financial education to all children, preparing students for successful life and active self-development according to rapid changes in modern society. The significance of introducing financial education into Russian school curriculum is determined by the current state of social and economic relations in the country and their development prospects, global trends in financial education, the need to improve the level and quality of life of today's and future generations of Russians. Therefore, it is necessary to update curricula, and to determine modern content for financial education and methods for teaching it at school (Baltgailis, 2019; Rohaeti, 2019; Pasani, 2019). In this regard, nowadays the key issue is the integration of the content of financial education into the content of existing school subjects (mathematics, geography, history, etc.), while the mechanisms of the practical implementation of this task are still to be found.

The goal of the research was to define the content of such concepts as “financial literacy” and “financial capability”, to substantiate their interdependence within a synergistic approach, and to analyze the ways of their formation among Russian students in grades 7–9 when teaching mathematics.

Methods

In this article we applied general scientific methods of cognition: systematization of theoretical and practical material, induction, deduction, comparative analysis, and synthesis. The combination of these methods enabled us to obtain reliable results and valid conclusions.

Results and Discussion

Today, the conceptual and methodological aspects of the formation and development of financial literacy are explored by various fields of science, including economics, sociology, education, and

cultural studies. The synergetic effect resulted in the emergence of numerous interpretations of the concept of “financial literacy” when this category was adapted to the goals and objectives of a specific area of applied research.

Having analyzed Russian and international papers, we singled out two main approaches to defining this concept:

- 1) the structural and functional approach, which considers financial literacy:
 - from the perspective of education as integral part of the social competence of the individual, an integral characteristic of a personality that determines his financial relations with society (Podbolotova & Demina, 2014; Rutkovskaya, 2017);
 - from the perspective of sociology as a feature that characterizes the rationality of a person’s financial behavior (Kuzina, 2015; Dulina, Moiseeva and Nebykov, 2017);
 - from the perspective of economics as an inherent ability of a person to manage their personal finances to ensure financial security and personal welfare, as well as to make effective financial decisions (Mandell, 2007; Ryzhanovskaya, 2010);
- 2) the social and cultural approach, defining financial literacy as a component of financial culture, which in turn includes such cultural elements as knowledge, skills, values, norms, and traditions; they are considered against a broad social and cultural background and reflect the local cultural specifics (Danes & Yang, 2014; Fatikhov & Nasibullin, 2010; Dulina, Moiseeva and Nebykov, 2017).

It should be mentioned that there is a consensus among researchers on the general definition of financial literacy in its broad sense: the analysts of the Organization for Economic Cooperation and Development (OECD) understand this type of human literacy as a combination of financial awareness, knowledge, skills, attitudes, and behaviors necessary for making sound financial decisions and, ultimately, achieving the financial well-being of an individual (OECD, 2011).

Having studied Russian and international theoretical sources, we found out that currently there are some narrower definitions that focus on certain specific aspects of the concept, such as:

- 1) financial literacy in the narrow sense of the word refers solely to the knowledge acquired by a person, an indicator of the understanding of main financial categories, concepts, processes, and phenomena;
- 2) financial capability characterizes a person’s ability to apply the acquired knowledge in practice, with a stronger emphasis on the basic skills of personal planning rather than the ability to use financial products and services on the market (Kuzina, 2015).

In our opinion, the Russian equivalent to the concept of “financial capability” does not fully reflect the content of the English term. The Oxford English Dictionary defines capability as a person’s legal capacity, an element of his legal personality. This fact is especially relevant in the context of the implemented project of the Ministry of Finance of Russia and the World Bank “Promoting Financial Literacy and Financial Education in the Russian Federation.” This program, representing one of the priorities of the state policy, aims to increase protection of the consumer of financial products and services.

Financial capability has not been studied in detail yet, so Russian researchers often understand it as the ability to use financial rights, to fulfill financial obligations, and to bear financial and legal responsibility. In accordance with the existing types of civil legal capability, Russian legal experts distinguish the following types of financial capability: full, incomplete (partial and indirect), limited, and lost. This approach allows assessing the burden of responsibility of an individual for financial support of his life at different stages of financial development that correspond to the stages of a person’s life (Trofimova, 2016).

There are different approaches to interpreting financial literacy, and Russian researchers have not reached consensus on the application of the terms “financial literacy” and “financial competence”, as a result of which in modern scientific works these concepts are often used as synonyms. In this study, in line with the objectives set, we considered “financial competence” as “financial capability.” Despite the interdependence of the terms “financial literacy” and “financial capability”, these categories have different meanings, which is why it seems viable to draw a clear line between them. This approach is based on the study findings of Russian sociologists Dulina, Moiseeva and Nebykova (2017), who formulated the following main propositions:

- in the broad sense of the word, financial literacy can be passive (a person’s financial knowledge, understanding of the laws of the financial sector, as well as the ability to compare and evaluate products and services offered by financial institutions) and active (used in practice, or reflecting the ability of the individual to carry out practical actions and which is formed through financial education);
- people have different levels of the formation and development of financial literacy.

Therefore, according to these characteristics, we can identify the following varieties of financial literacy in the broad sense of the word: a) financial illiteracy as an unformed and undeveloped quality; b) financial literacy as a quality that was not formed, but developed; c) financial capability representing a formed and developed quality. At the same time, without passive financial literacy, which represents financial literacy in the narrow sense of the word, there could be no effective manifestations of active financial literacy (financial capability).

One of the objective problems arising when one seeks to determine the content of the category of “financial literacy” is the symbiosis of scientific and quasi-scientific knowledge in the modern mass media, in other words, the problem of demarcation. According to Dorzheev and Gorshkova (2015), currently the main directions of pseudoscience about finance are popularizing simplified financial knowledge in the media and claim to develop skills that allow “modeling wealth by the power of thought and character”. Under current conditions when developing technologies are aimed at influencing and manipulating a person’s mind, these trends can be observed in both the Russian and international media, that, in turn, promote authors’ theories and methods of “opinion leaders” who are spreading their quasi-scientific theories and beliefs through seminars, trainings and courses for people without financial education. According to the researchers, the consequences of spreading pseudoscientific knowledge among the population are detrimental and include decreasing the intellectual level of society, propagating irrational beliefs, and, finally, complete degradation. To solve this problem of demarcation, one should promote the scientific approach to finance, its forms and functions, the main aspects of the regulation of financial relations, which implies the formation of not fragmentary and often superficial, but deep knowledge and basic skills of their practical application.

Thus, the complexity and variability of financial relations, frequent changes in the financial system in the modern world increase the significance of financial education, and the most effective approach is to target educational programs. In this study, we focused on the financial education of schoolchildren as a special target group participating in financial relations.

Financial literacy of schoolchildren was studied in three stages (in 2012, 2015, and 2018) as part of the International Program for the Assessment of Student Educational Achievements (PISA), conducted in many countries all over the world under the auspices of OECD. Russia has been a member of all PISA studies since 2000, including the last three, the participation in which was initiated by the Russian Ministry of Finance as part of the project “Promoting Financial Literacy of the Population and Developing Financial Education in the Russian Federation,” implemented since 2011 together with the World Bank (Ministry of Finance of the Russian Federation, 2012; OECD, 2015). In 2012, Russia ranked 10th among 18 participating countries, in 2015 – the 4th among 15 participants in the study. The results obtained in 2012 and 2015

allowed evaluating the financial literacy of schoolchildren and analyzing the effectiveness of the measures implemented within the national project. Also, this helped to assess the readiness of 15-year-old students for making effective decisions in various financial situations, for adapting to and using global financial systems that are constantly developing. (Ministry of Finance of the Russian Federation, 2012; OECD, 2015).

In the PISA program, the concept of “financial literacy” is defined as “knowledge and understanding of financial concepts and financial risks, as well as the skills, motivation and confidence necessary to make effective decisions in various financial situations that contribute to improving the financial well-being of individuals and society, as well as opportunities for participation in economic life” (Ministry of Finance of the Russian Federation, 2012; OECD, 2015). Analysis of the approach developed by OECD led to identification of the structure of the key competencies related to the financial literacy of 15-year-old students: subject areas (four blocks of topics), with each of them forming three types of competence related to financial literacy (Figure 1) (OECD/INFE, 2015).

It should be noted that the results of the PISA study revealed a close relationship between the level of financial literacy of schoolchildren and the level of their mathematical literacy: in Russia the coefficient of indicators correlation was 0.73 (OECD, 2015). In view of this fact, we drew a conclusion that school mathematics plays a crucial role in the formation of financial literacy and financial capability of students. At the same time, learning materials with financial focus develop cognitive and social activity of students, create motivation for studying mathematics, expand the scope of applications of the mathematical apparatus, and develop computational skills. Mathematics, in turn, serves as a tool for the formation of financial literacy and financial capability of students.

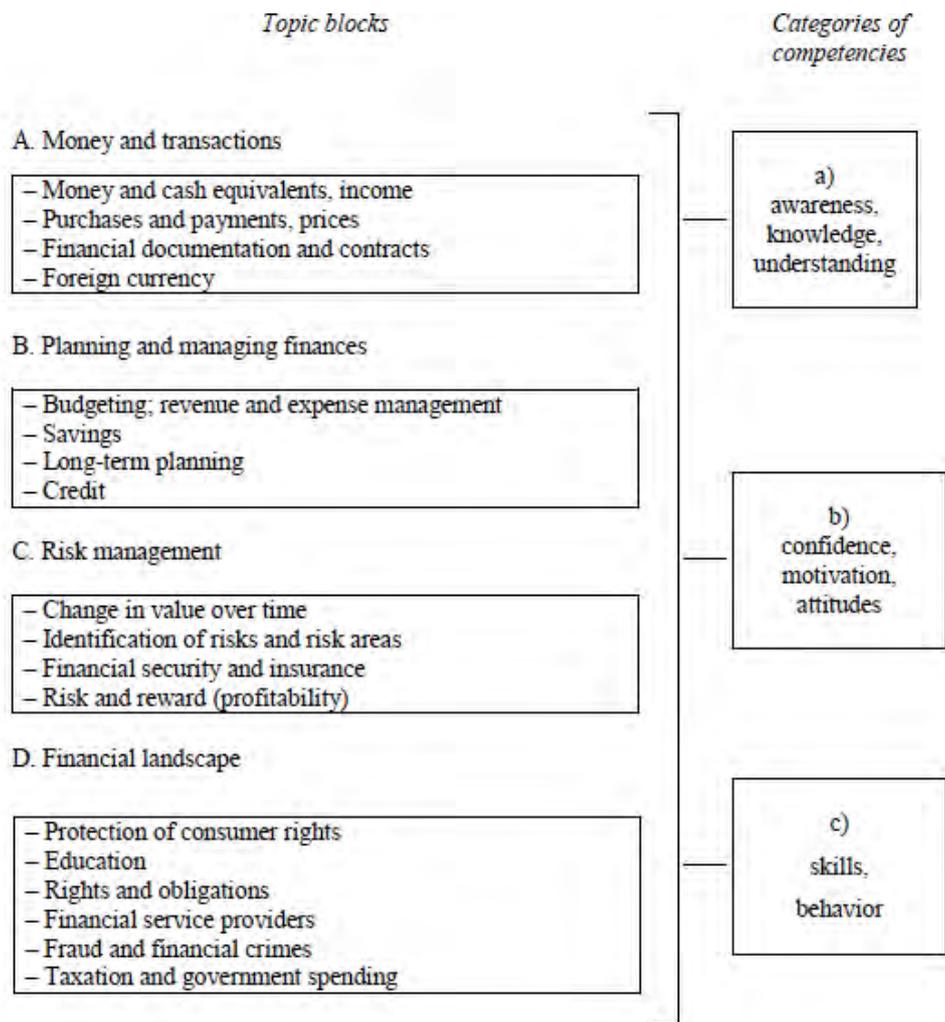


Figure 1. OECD competencies framework of financial literacy for PISA

Having studied scientific and methodical sources, we established that most researchers consider word problems to be the most important and effective means of forming students' financial literacy in the course of mathematics (to denote these tasks we introduced the term "mathematical problems with the financial component"). We share the opinion of Sedova (2017), who claims that these tasks "can be applied at all stages of the learning process, from demonstrating the ability of mathematics to solve everyday problems to creating a problem situation, which requires developing a mathematical theory to work it out". The results of pedagogical research aimed at establishing intersubject connections confirm the high potential of integrating the financial component into the school course of mathematics.

As part of the study, we compared several algebra textbooks for grades 7–9 written by different groups of authors that are widely used in secondary schools of the Russian Federation. We analyzed the mathematical problems with the financial component, as well as the theoretical material forming their basis. Before that, according to the OECD Competencies Framework of Financial Literacy for PISA (Figure 1), we identified the competencies that should be formed by schoolchildren in grades 7–9 while studying the course of algebra and solving mathematical problems with the financial component and mastering the corresponding theoretical material (Table 1).

Table 1.

The competencies of financial literacy formed by schoolchildren in grades 7–9 in the course of algebra

No	Category of Competencies	Competencies
1	Awareness, knowledge, understanding	Basic knowledge of the following concepts of the financial sector: money, banknotes, coins, nominal value, price of goods, cost of goods, discount, sale on a promotional basis, supply and demand, market equilibrium, trade deficit and surplus, deposit, loan, interest on deposit, interest on the loan, interest rate, compound interest, accrual rate on the deposit, revenue, cost, profit, loss, capital savings, capital increase, budget, family budget, income, expenses
2	Skills, behavior	Ability to: – solve problems applying the studied financial concepts on a basic level; – give examples of linear dependence in the calculations related to the cost of goods and services; direct proportions in the calculations involving “price” and “cost”, “quantity” and “cost”; inverse proportions for “price” and “quantity”; – solve contextual financial problems with simple questions that require counting (for example, calculating interest on a deposit), problems requiring the understanding of interest rate mechanisms and the analysis of alternatives
3	Confidence, motivation, attitudes	The ability to independently build mathematical models of the financial situation according to a mathematical problem with the financial component, to make financial decisions involving the assessment of the situation on the basis of the formed financial attitudes

Next, we obtained and analyzed the following quantitative characteristics for each textbook:

- the ratio of all word problems (WP) in the textbook and the total number of practical problems in it (PP): WP/PP ;
- the ratio of the problems with the financial component (PFC) and the total number of practical problems (PP) in the textbook: PFC/PP .

The results of the quantitative analysis are shown in Table 2. At the same time, the content of the problems with the financial component, as well as the theoretical material on the basis of which they were proposed, were qualitatively evaluated.

Table 2.

Quantitative analysis of textbooks with a focus on word problems and problems with the financial component

No	Authors	Algebra 7		Algebra 8		Algebra 9	
		WP/PP	PFC/PP	WP/PP	PFC/PP	WP/PP	PFC/PP
1	A.G. Mordkovich, L.I. Zvavich, A.R. Ryazanovsky, A.L. Alexandrova, P.V. Semenov	10.13	1.16	6.83	0.28	11.27	2.12
2	S.M. Nikolsky, M.K. Potapov, N.N. Reshetnikov, A.V. Shevkin	10.00	1.60	23.60	3.68	9.08	1.28
3	A.G. Merzlyak, B. B. Polonsky, M.S. Yakir	13.53	0.97	10.15	0.64	15.92	1.82
4	G.K. Muravin, O.V. Muravina	33.33	7.48	25.44	3.77	13.19	5.03

Having analyzed the textbooks that are widely used in secondary schools in Russia and in Lipetsk region (items 1-3 in Table 2), we revealed the following characteristics of the educational material regarding the problem under study:

- a small share of applied problems in algebra textbooks;
- insufficient number of problems with the financial component aimed at the formation of competencies stated in Table 1;
- poor variability of most tasks;
- the information presented in most problems has no personal significance for students;
- some problems contain financial concepts that schoolchildren of this age have not studied yet or do not understand;
- fragmentariness and episodic presentation of problems with the financial component, which prevents students from developing systemic financial knowledge.

In this comparative analysis, we also considered the algebra textbook written by G.K. Muravin and O.V. Muravina (item 4 of Table 2). This textbook is aimed at developing financial literacy of schoolchildren with an integrative approach. Thus, the financial economic component is integrated into the main content of the mathematics course. For this purpose, the authors developed the materials and methodology aimed at forming financial literacy in the school mathematics course and implemented these elements in the teaching package for the course of mathematics in grades 1–11. This enabled to include the financial component and the basic financial concepts in textbooks, workbooks, teaching aids, and didactic materials for each grade. In 2017, G.K. Muravin and O.V. Muravina developed collections of special modules on financial literacy for printed and electronic forms of textbooks on mathematics for grades 1–10 (these collections were developed as part of the order of the Ministry of Finance of Russia during the implementation of the national project “Promoting Financial Literacy of the Population and Financial Education in the Russian Federation”). This course consistently develops financial literacy of students in each grade through the relevant content and methodology. It is worth noting that each collection contains the optimum share of the materials with the financial component compared to the general mathematical content.

Conclusion

Having studied the materials aimed at the formation of financial literacy and financial capability of schoolchildren in the course of mathematics, we could identify certain problem areas and, based on them, formulate conclusions and recommendations.

At present, most popular school textbooks of algebra for grades 7–9 do not contain high-quality materials which would enable children to develop financial competencies in accordance with the OECD framework. Therefore, it is necessary to expand the content of math textbooks by including problems with the financial component and related theoretical material. We also consider it viable to create collections of problems and methodological recommendations for these materials. In this regard, it is crucial to consolidate the experience of experts in different fields: mathematics, economics, education, and methodology of teaching mathematics.

Developing educational content, one must adapt financial concepts, categories, financial processes, and phenomena to the age characteristics of students. Mathematical problems must have relevant financial content (realistic situations, compliance with personal interests of students). We believe that the educational process must include systematic and coordinated formation and development of both mathematical and financial literacy of students. It should effectively demonstrate the possibilities of using the mathematical apparatus in practice for managing one's finances and the models of competent financial behavior.

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