SOCIAL-EMOTIONAL LEARNING IN SYNERGY WITH MATHEMATICAL AND FINANCIAL LITERACY

Vladimir Tirolski

Faculty of Mathematics and Informatics, Paisii Hilendarski University of Plovdiv,
vladimirtirolski@uni-plovdiv.bg

Abstract. In a world of globalization and the need for knowledge and skillful use of financial instruments in everyday life, students need to have good financial literacy. Financial literacy is not just the ability to understand personal finances, it is one of the key skills for life in the 21st century [10]. At the same time, the most suitable subject through which this can be achieved is mathematics. The article examines methods by which mathematical concepts are learned not only cognitively, but also through an emotional experience, which creates a lasting impression in the minds of students. The methods used to achieve the goals of the study are gamification, project-based learning, learning through experience in combination with induction, deduction and reflection.

The study was conducted with fifth-grade students, and an appropriate system of tasks was developed with the aim of better mastering the conceptual apparatus and modern financial tools.

Keywords: *Integration, SEL, financial literacy, percentage*

Introduction

The ability to handle money and financial products is a key competence in the modern market world. In a market economy, satisfying Maslow’s basic human needs for food, shelter and security is unattainable without these skills. That is why financial literacy of students is extremely necessary. One of the approaches to developing financial competence is socio-emotional learning.

CASEL organization [8] is the first institution to use the term “social and emotional learning” (SEL) and describes SEL as a set of 5 areas of competence,

namely self-awareness, self-management, social awareness, relationship skills and responsible decision-making, known as the "CASEL Framework".

In 1920, Thorndike [7] first used the concept of social intelligence, thus initiating the study and recognition of the importance of non-cognitive processes in determining an individual's intelligence. But what does it actually mean to be socially and emotionally intelligent?

Emotional intelligence is the ability to recognize and understand both our own and others' emotions, to be able to find a connection between our emotions and our behavior, while also being able to control them. Social intelligence is the ability to successfully build and maintain relationships, which includes understanding and connecting with others, dealing with conflict, and creating lasting social bonds.

Financial literacy, defined as the set of knowledge, skills, and attitudes necessary to make informed financial decisions, is a suitable synergistic model for developing both mathematical competencies and socio-emotional skills. Research shows that well-developed socio-emotional skills improve academic performance and increase student engagement in the learning process [3]. The complex teaching approach used in the present study integrates social emotional learning in synergy with the development of mathematical and financial literacy, through experiencing and solving real financial cases in mathematics problems.

Methodology and description of experiment

The cognitive perception of the mathematical concept of "percent" is extremely difficult for 5th grade students. The abstract introduction of the definition of a part of a whole must be linked to everyday, practical examples. In this regard, an experiment was conducted with 5th grade students at the "L. Karavelov" Secondary School in Plovdiv. The experiment was conducted after mastering the basic knowledge provided for the state educational standard [9]. The time for implementation is allocated between the mandatory classes and afternoon activities.

To determine the level of knowledge acquisition, a primary test was conducted. The students were divided into an experimental and a control group, with students from one class studying in a traditional way – control group (CG), and the other class participating in the experiment – experimental group (EG).

We set two goals for the study:

- Goal 1: To measure the effectiveness of social-emotional learning on students' understanding and long-term retention of the concept of "percentage."

- Goal 2: To determine the extent to which social-emotional learning influences changes in students' attitudes, engagement, and motivation toward learning mathematics.

The pedagogical methods used in the experiment are gamification, project-based learning, experiential learning in combination with induction, deduction and reflection. An additional motivational element and catalyst for the maximum concentration of students was the holding of a lesson outside the classroom. The use of diverse approaches in teaching leads to stimulation of students' motivation to learn [6]. The experiment took place in three stages, with each stage serving as the basis for the next. In the first stage, students learn through experience by conducting a survey in a grocery store. The remote classroom approach is implemented through group work, with each group consisting of 4 students. The group's task is to find and describe on a pre-created worksheet at least 5 promotions from the product group in which it works. Social-emotional skills such as responsibility and self-organization, time planning, empathy and teamwork are developed. In the second stage, students prepare an analysis of the results obtained from the study. Based on the completed worksheets, the promotions are divided into two groups. The first group is promotions in which the percentage is explicit and present in the information, and the second includes those in which the percentage of the promotion must be found, such as – Two for the price of one; every fourth package is free, etc. The second stage ends with a reflection in which students seek answers to questions such as: why are promotions made; which promotion caught their attention and why; what would the promotion composed by them look like, what is VAT and does it affect the promotion, etc. In the third stage, students from each team create an advertising page in which they include products from a product group they have researched and describe promotions they have proposed. Each page represents a final product of project-based learning. One way to influence the student's abilities is through the formation of knowledge as products made by the students [4]. The third stage ends with a gamification method, in which students from one group take on the role of a client, and students from another – in the role of a seller. The client group has a budget of 30 leva, which they must spend a maximum of at least 3 products, but without exceeding it. By calculating prices after a promotion, students discover general patterns from specific data, which is also expressed in the inductive learning method. At this stage, critical thinking is formed, social skills are developed through communication in the group, financial awareness is formed, and a real situation is provided that reveals the importance of understanding the concept of "percentage". Academic progress and durability of knowledge is monitored by conducting a test. The test is designed to cover the mandatory material in DOS related to working with percentages. The search for the relationship between decimals, common fractions, percentage, and the currency unit lev has been conducted. The tasks examine two main aspects of working with percentages – finding a percentage of a number and finding a

number from a percentage. The emphasis is on the applicability of mathematics, considering various everyday scenarios such as promotions, discounts, profit, interest, and savings. The same test is used with which the experiment was started, but the test itself is conducted 3 weeks after the end of the experiment.

Measurement and analysis of research results

Challenges in measuring the effect of SEL are due to the long-term nature of the training, lack of standardized measurement tools, influence of external factors such as family environment, peers, etc. The method used in the study to assess the effectiveness of social-emotional learning includes measuring sensitivity to teaching. The concept of sensitivity to teaching was first introduced by D. Koskoff and S. Klein in 1974 [1]. This dependence has a quantitative dimension, represented by various coefficients and indices such as the coefficient of W. Popham, the index of R. Brennan, the index of T. Black [2], etc. For the purposes of the study, the index of K. Crispin and D. Felduson was used. The limits of this index are within the range from -1 to +1 and the higher its value, the greater the effect of the training. It is calculated by the formula: $s = \frac{R_A - R_B}{T}$, where

- R_A– number of students who correctly solved a task after the SEL training;
- R_B– number of students who correctly solved a task before SEL training;
- T– total number of students surveyed.

Using this method, I measured the positive or negative effect that socio-emotional learning had on students in the experimental group during their mathematics training on the topic of “Percentage”. The results of the study are presented in Table 1.

Table 1. Results of a study of the effect of SEL according to the index of K. Crispin and D. Felduson

Experimental group (EG)			
Number of participating students T	**Number of students who solved tasks before training through SEL R(B)**	**Number of students who solved tasks after training through SEL R(A)**	**Index of K. Crispin and D. Felduson S**
27	6	9	0,11

Statistical models were used to measure the durability of knowledge and how SEL influences this process.

The results of the study are as follows:

- primary test KG – 4.12; EG – 4.24;

- secondary test (3 weeks after experiment) – CG – 3.95; EG – 4.40.

A summary of the results of measuring academic progress and knowledge retention is presented in Figure 1.

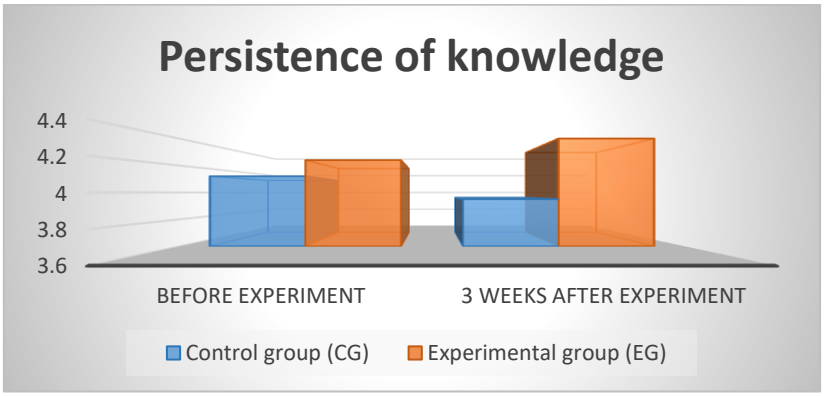

Figure 1. Results of measuring academic progress and knowledge retention

Conclusions

The conducted study shows that the knowledge acquired through practical experience in a real situation is more durable, compared to traditional training. The assimilation of material only at a cognitive level can lead to the impermanence of knowledge. The results demonstrate a direct correlation between the experimental education and the achieved, albeit with a small difference, more lasting knowledge set with the goal 1. Beyond the numerical expression of the learned results, there remains an increased motivation for learning among the students from the experimental group. However, this process has a dampening effect over time. This does not negate the achievement of the second goal in the conducted research, but it shows that in order to obtain a lasting effect from the application of innovative approaches, such as distance learning, a certain cyclicality in their application is necessary.

Resume

Without emotional intelligence, people are more vulnerable to financial fraud and impulsive actions. Individuals with higher emotional intelligence are more likely to make better long-term financial decisions, cope with money-related stress, and avoid impulsive spending [5]. Insufficient financial literacy and lack of socio-emotional skills can lead to serious social problems such as over-indebtedness, poverty, stress, and mental health problems. The proposed teaching methodology develops lasting socio-emotional resilience in synergy with financial literacy and mathematical competence in the student. They are a prerequisite for dealing with the upcoming social, emotional, and financial challenges that life will bring.

References

[1] Bijkov, G., *Theory and methodology of didactic tests*, Prosveta, Sofia, 1992, ISBN: 954-01-0107-7

[2] Black, T., Discrimination index for Criterion-Referenced Test-Items, *British journal of Education Psychology*, 1987, vol. 3 (57), pp. 380–388

[3] Durlak, J., R. Weissberg, A. Dymnicki, R. Taylor, K. Schellinger, The impact of enhancing students' social and emotional learning: A meta-analysis of school-based universal interventions, *Child Development*, 2011, vol. 82 (1), pp. 405–432, DOI: https://doi.org/10.1111/j.1467-8624.2010.01564.x

[4] Grozdev, S., Olimpiadi i sinergetika, *Mathematics and Education in Mathematics. Proceedings of the Thirty Second Spring Conference of the Union of Bulgarian Mathematicians*, Sunny beach, 2003, pp. 101–116, ISSN: 1313-3330

[5] Kahneman, D., *Thinking, Fast and Slow*, Penguin random house, Dublin, 2011, vol. 1, ISBN: 978-0-141-03357-0

[6] Staribratov, I., The presentation in mathematics and computer science classes, *Archimedes and Diogenes*, 2019, pp. 183-188, ISSN: 2534-8795

[7] Thorndike, R., Intelligence and Its Uses, *Harper's Magazine*, 1920, vol. 140, pp. 227–335

Notes

[8] CASEL, CASEL, 2025, Retrieved from: casel.org: https://casel.org/about-us/our-history/

[9] MON, Mathematics curriculum for grade 5, 2023, retrieved from: https://www.mon.bg/nfs/2023/11/up_v_math.pdf

[10] OECD, 2016, retrieved from: https://www.oecd.org/finance/financial-education/2016-OECD-INFE-Core-Principles-Financial-Literacy.pdf