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Financial Education in the Teaching of Integers: A Didactic Experience for Citizenship Education

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ABSTRACT: Economic and Financial Education (EFE) is a key component in the formation of citizens who can understand the value of money and make responsible decisions about its use. This article addresses the integration of EFE into the teaching of integers in mathematics and highlights its potential to connect school learning with real-life situations. The methodology is based on a review of prior studies that traces the development of EFE from international frameworks to its progressive implementation in the Colombian educational context. Subsequently, a didactic experience with sixth-grade students from a private multilingual school is presented, in which gains and losses are used as representations of positive and negative numbers to strengthen the understanding of the addition and subtraction of integers. It is concluded that integrating Economic and Financial Education with mathematics fosters meaningful learning and promotes responsible financial decision-making.

KEYWORDS: Economic and Financial Education, integers, gains and losses, decision-making, mathematics.

1. INTRODUCTION

Economic and Financial Education (EFE) emerged in Colombia around 2008 as a response to the international financial crisis and to local issues, such as the phenomenon of pyramid schemes, which reflect a low level of financial literacy among the population (González, 2009; Rodríguez-Pinilla, 2015). In this context, the country has made progress in formulating public policies to promote a responsible economic culture, such as Law 1328 of 2009, and in implementing national strategies focused on citizens' financial education.

However, the results obtained by Colombia in international assessments such as PISA reveal significant difficulties in understanding the value of money, distinguishing between needs and wants, and making basic financial decisions (OCDE, 2014). These results highlight not only a gap in the teaching of EFE, but also a lack of articulation among different areas of knowledge, particularly with mathematics.

In the school context, Economic and Financial Education is often addressed in an isolated manner or as a poorly structured transversal component, limiting its impact on the development of students' competencies. As noted by Valbuena-Duarte et al. (2020), many educational institutions lack specific training in this field, hindering its integration into pedagogical practices. This situation creates a disconnect between mathematical content and its application in everyday life.

In this context, it is necessary to design pedagogical proposals that integrate the teaching of mathematics with real-life situations. Therefore, the purpose of this article is to analyze the integration of Economic and Financial Education with the teaching of integers through a didactic experience based on contexts of gain and loss, which promotes meaningful learning and the development of competencies for responsible decision-making.

2. LITERATURE REVIEW

3.1. Economic and financial education: origin and development

Economic and Financial Education (EFE) originated in 2008, in an international context marked by the global financial crisis. This event, which began in the United States, revealed the high level of household indebtedness and the lack of real backing to meet financial commitments. The "subprime" mortgage crisis exposed the absence of financial education among citizens, most of whom were unaware of the risks associated with their economic decisions (González, 2009). This situation not only had repercussions in international markets but also prompted a profound reflection on the need to educate individuals about financial matters.

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In Colombia, during the same year, a particular situation arose involving the phenomenon of “pyramid schemes” or illegal money collection systems, such as the case of DMG. Thousands of citizens lost their savings due to a lack of knowledge of basic investment and risk principles. These events reinforced the idea that the country faced widespread financial illiteracy, prompting discussions about the need to incorporate financial education into public policies (Rodríguez-Pinilla, 2015). In this way, it can be stated that 2008 marked the beginning of EFE in Colombia as a response to both the international crisis and internal issues arising from the lack of economic and financial culture.

2.2. Financial education in the Colombian context

The next important milestone occurred in 2009, with the enactment of Law 1328, which established regulations in financial, insurance, and securities market matters. This law introduces financial consumer protection, obligating supervised entities to develop financial education programs for their users (Congreso de la República de Colombia, 2009). In addition, during that same year, the OECD (Organization for Economic Co-operation and Development) organized conferences and published documents promoting financial education as an essential tool for economic well-being and social stability. Thus, Colombia began to align with international recommendations on the importance of strengthening its citizens' financial competencies (García, 2021).

In 2012, concern about the level of financial literacy became more evident with the incorporation of the financial competence component in the PISA assessment, administered by the OECD. The results showed that Colombian students had low levels of knowledge in managing basic financial concepts, reflecting a structural deficiency in the educational system (Vargas, 2016). At the same time, the World Bank and the Banco de la República (Central Bank of Colombia) published studies showing that a large portion of the Colombian population does not plan their expenses nor have saving or investment habits, which reaffirmed the urgency of implementing educational strategies in this field (Banco de la República, 2012).

By 2014, the Ministry of National Education (MEN), together with Asobancaria, presented Document No. 26, Pedagogical Guidelines for Economic and Financial Education, which proposes integrating EFE into the school curriculum from basic education. This document defines thematic axes such as economics, personal finance, responsible consumption, saving, investment, and credit management (Ministerio de Educación Nacional, 2014). During this same period, Law 1450 of 2011, which corresponds to the National Development Plan, reinforces the inclusion of financial education among the country's strategic development objectives.

Subsequently, in 2017, a decisive step was taken with the creation of the Intersectoral Commission for Economic and Financial Education (CIEEF) and the publication of the National Strategy for Economic and Financial Education (ENEEF). This document, coordinated by the Banco de la República and the Ministry of National Education, aims to coordinate efforts among the public, private, and educational sectors to promote a sustainable financial culture. The ENEEF recognizes that EFE should promote not only knowledge but also attitudes and responsible behaviors regarding money and the economy (Comisión Intersectorial para la Educación Económica y Financiera [CIEEF], 2017).

Later, in 2023, the pedagogical approach of EFE was revisited and updated through the document Mi plan, mi vida y mi futuro, estrategia nueva pangea, developed by the MEN. This guide aims to strengthen students’ comprehensive education by developing financial competencies, personal economic planning, and informed decision-making (Mondragón, 2023).

2.3. Relationship between mathematics and financial education

Currently, Economic and Financial Education (EFE) is an essential tool for strengthening responsible citizenship. Its purpose is not limited to acquiring knowledge of saving, investment, and consumption, but also to developing mathematical skills for everyday life. In this sense, teaching addition and subtraction of integers is particularly relevant, as it enables understanding of fundamental financial concepts such as gains, losses, debts, and net balances (Amezcua, 2017).

Various studies have shown that financial literacy is closely linked to mathematical competence. In Mexico, Amezcua (2017) found that young people with greater mastery of basic arithmetic operations, such as the addition and subtraction of integers, demonstrate a better understanding of money management, saving, and investment. Similarly, Méndez et al. (2022) state that in Latin America, there is a direct relationship between numerical understanding and the ability to make sound financial decisions, indicating that EFE should not be taught in isolation but rather integrated into the mathematics curriculum.

2.4. Integers in financial contexts

When applied in financial contexts, the addition and subtraction of integers help students understand that positive numbers represent income or gains, while negative numbers represent expenses or losses. For example, a person who starts with a balance of $100,000 and spends $40,000 ends with a final balance of $60,000. This type of contextualized exercise in school education goes beyond the purely numerical domain, fostering financial analysis skills, expense planning, and informed decision-making (García et al., 2013).

In Colombia, efforts to incorporate EFE into the educational system were consolidated with the creation of the National Strategy for Economic and Financial Education (ENEEF), promoted by the Ministry of National Education, the Financial Superintendence, and Asobancaria. These policies promote the development of citizens capable of understanding the consequences of their economic decisions, which can be effectively achieved by using financial contexts in the teaching of mathematics (MEN, 2021).

In addition, the application of these contents fosters the understanding of concepts such as risk and economic sustainability. A didactic example could be the monitoring of a “school budget” or a “mini-enterprise” in the classroom, where students record money inflows (+) and outflows (–). Through this activity, the interpretation of negative results as losses or debts and of positive results as gains or surpluses is encouraged.

Therefore, the purpose of this proposal is to articulate the area of Mathematics with Economic and Financial Education, taking as a central axis the competency of the program Mi plan, mi vida, mi futuro, which promotes responsible decision-making in everyday situations related to gains and losses (MEN, 2014). This articulation is supported by the Mathematics Basic Learning Standards (DBA, Derechos Básicos de Aprendizaje), which establish that students must use the properties of integers and rational numbers, along with the associated operations, to develop strategies and calculation procedures for problem-solving (MEN, 2016).

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3. MATERIALS AND METHODS

The present study was developed based on a progressive review of international and national references on Economic and Financial Education (EFE), following a conceptual timeline that enabled understanding of its evolution from the global context to its implementation in the Colombian educational setting.

Based on this theoretical foundation, a didactic proposal was designed to articulate the teaching of integers with real financial situations. The experience was conducted with sixth-grade students from a private bilingual school in Barranquilla, Colombia.

The proposal consisted of a didactic sequence structured into three main activities. In the first activity, a comic story was presented that narrated the creation of a lemonade stand from an initial investment, with the aim of introducing concepts such as income, expenses, gains, and losses. In the second activity, students simulated the management of a school mini-enterprise, recording each income (+) and expense (–) through integer operations, which allowed them to analyze how capital varied based on their decisions. Finally, in the third activity, students shared their results on a digital collaborative board (Padlet), reflecting on their financial decisions and possible improvements.

This methodology enabled students to relate mathematical concepts to everyday situations, thereby promoting critical thinking, decision-making, and a meaningful understanding of integers in financial contexts.

4. RESULTS

The results of implementing the didactic sequence are presented below, structured into three activities that demonstrate students' understanding of integers in financial contexts.

5.1. Activity 1. Understanding of financial concepts

In this activity, the students (see Figure 1) observed and analyzed the comic story "Between profits and losses," which introduces the concepts of income, expenses, gains, and losses in a contextualized way. Based on the reading, the students identified how financial decisions influence a small business's economic outcomes.

Likewise, students began to relate these concepts to integers, understanding that gains can be represented by positive values, while losses are represented by negative values.

Figure 1: Introductory section
Source: Author's own elaboration.

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4.2. Activity 2. Simulation of a school mini-enterprise

In the second activity, students participated in the simulation of a school mini-enterprise, in which they had to make decisions regarding resource management. Each group selected a product or service and recorded their income (+) and expenses (–) through operations with integers.

To do this, they used a value table (see Figure 2) to organize information on initial capital, gains or losses, and final capital. This tool facilitated understanding of how decisions directly influence the business's financial stability.

During this activity, students correctly applied operations with integers in a real context, identifying how capital increased or decreased based on the actions taken.

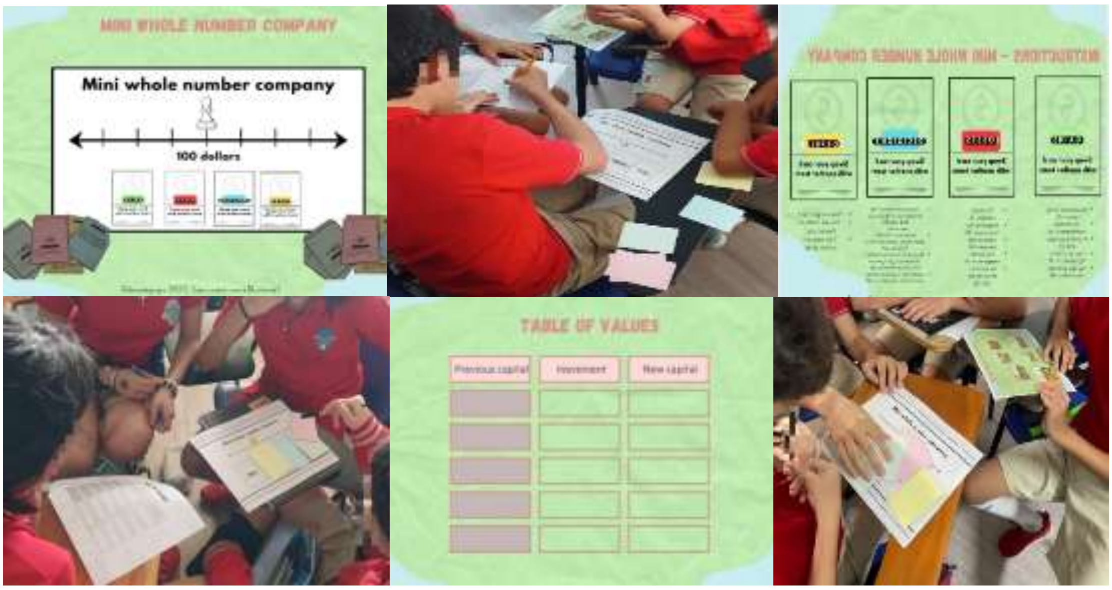

Figure 2: Our mini school business
Source: Author's own elaboration.

4.3. Activity 3. Presentation and reflection on results

In the final activity (see Figure 3), students presented the results of the mini-enterprise simulation and explained the decisions made and their impact on the final capital. To do so, they used a digital collaborative board (Padlet) to record their conclusions and reflections.

This activity enabled students to demonstrate critical thinking, as they analyzed their successes and mistakes and proposed improvements in financial decision-making. In addition, they were able to communicate their ideas in a well-argued manner, relating the results obtained to the concepts addressed throughout the didactic sequence.

Figure 3: Final Activity
Note: Padlet used for the presentation of results. Author's own elaboration.

5. DISCUSSION

Based on the development of the didactic proposal, it is evident that the articulation between Economic and Financial Education (EFE) and the teaching of integers constitutes a relevant strategy to promote meaningful learning in the classroom. In line with the Ministry of National

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Education's (MEN, 2014) proposal, the use of financial contexts—such as income, expenses, gains, and losses—allows mathematical concepts, which students traditionally perceive as abstract, to gain meaning.

In this sense, the designed activities, especially the initial comic story and the simulation of the school mini-enterprise, facilitated the connection between mathematical theory and real-life situations. This is consistent with what Annamaria Lusardi (2019) states, highlighting the importance of financial education as a key tool for informed decision-making, as well as with the results of the OECD (2014), which emphasize the need to develop financial competencies from school.

Likewise, the expected results allow us to infer an increase in student motivation and participation, consistent with research showing that the use of applied contexts improves mathematical learning (Amezcua, 2017; Méndez Prado et al., 2022). In the same vein, recent studies indicate that integrating mathematics with real-life situations enhances not only academic performance but also the development of life skills (Documento sin autor, 2024).

On the other hand, the proposal also responds to the need identified in the Colombian context, where, despite regulatory advances such as Law 1328 of 2009 and the guidelines of the Intersectoral Commission for Economic and Financial Education (CIEEF, 2017), difficulties persist in the effective implementation of EFE in educational institutions (García, 2021; Mondragón, 2023). This reveals a gap between public policies and pedagogical practice in the classroom.

Consequently, this experience reaffirms what Valbuena (2023) and Valbuena-Duarte et al. (2020) propose: that economic and financial education, when articulated with school mathematics, contributes to the formation of critical citizens capable of making informed decisions in their daily lives. Likewise, it aligns with perspectives that promote education focused on the comprehensive development of students (Darling-Hammond et al., 2020).

However, important challenges are also recognized, such as the need to strengthen teacher training and develop curricular strategies that enable the effective integration of EFE into the area of mathematics. In this regard, it is necessary to continue developing research and pedagogical experiences that expand and validate these results across diverse educational contexts, especially in Latin America (García et al., 2013; Potrich & Vieira, 2021).

6. CONCLUSION

The articulation between Economic and Financial Education and the teaching of integers is configured as a relevant pedagogical strategy for strengthening meaningful learning in the school context. Based on the implementation of the didactic sequence, it was observed that students were able to establish clear relationships between gains and positive values, as well as between losses and negative values, which allowed mathematical operations to gain meaning beyond their procedural nature.

In this sense, the use of real financial situations favored the understanding of integers from an applied perspective, promoting not only the development of mathematical skills but also the capacity for analysis, critical reflection, and informed decision-making in money management. In this way, it is reaffirmed that the teaching of mathematics becomes more relevant when it is linked to contexts close to the students' reality.

On the other hand, the experience highlighted the fundamental role of the teacher as a mediator in the construction of contextualized learning, which implies an active role in designing innovative didactic strategies that integrate different areas of knowledge. Consequently, Economic and Financial Education should not be conceived as an isolated component, but as a transversal axis that can be addressed in an interdisciplinary manner within the school curriculum.

Likewise, although there have been advances in incorporating Economic and Financial Education into the Colombian educational system, challenges persist for its effective implementation in the classroom. Therefore, it is necessary to continue promoting teacher training processes and the design of pedagogical proposals that facilitate its consolidation in educational practices.

For future research, it is recommended to further explore the impact of Economic and Financial Education across different educational levels, as well as its integration with various mathematical content, to broaden its scope and contribute to the formation of critical and responsible citizens in economic decision-making.

CONFLICT OF INTEREST:

The authors declare that there is no financial, academic, institutional, or personal conflict of interest that could have inappropriately influenced the development of the research, the analysis of the results, or the preparation of this manuscript.

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No funding was received for this research.

RESEARCH ETHICS

During the research process, the confidentiality and ethical handling of the collected information were ensured in accordance with the principles of anonymity, responsible use, and personal data protection. The information obtained from participants, including responses to instruments, performance in activities, and classroom interactions, was used exclusively for academic and research purposes, without disclosing data that could allow the individual identification of participants, the institution, or the teaching staff. To this end, anonymization mechanisms, such as alphanumeric codes, were employed, and appropriate security measures were implemented to safeguard the information. Likewise, data processing was carried out in accordance with Law 1581 of 2012 on personal data protection in Colombia, and the dissemination of results was conducted in aggregated form.

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