

Reflections of future Mathematics teachers on Financial Education: perspectives for Basic Education

Abstract: Since the publication of the Base Nacional Comum Curricular (National Common Curricular Base), Financial Education has become a topic to be developed in the classroom, mainly related to the mathematics curriculum. In this sense, teachers are in charge of addressing it. In view of this, in this paper we aim to discuss understandings of Financial Education aimed at Basic Education and produced by mathematics undergraduates, mobilized in two training meetings. Based on Critical Mathematics Education and the qualitative research paradigm, we identified five topics using content analysis procedures. The results of the analysis of these topics indicate that the future teachers have knowledge of School Financial Education, although they relate the subject to economic aspects and Financial Mathematics.

Keywords: Mathematics Education. Critical Mathematics Education. Financial Education. Degree in Mathematics. Teacher Training.

Reflexiones de los futuros docentes de Matemáticas sobre Educación Financiera: perspectivas para la Educación Básica

Resumen: La Educación Financiera pasó a ser, después de la publicación de la Base Curricular Común Nacional, un tema a desarrollar en el aula, principalmente relacionado con el componente curricular de Matemática. En este sentido, los profesores son responsables de su enfoque. Por lo tanto, en este artículo pretendemos discutir comprensiones sobre Educación Financiera dirigidas a la Educación Básica y que fueron producidas por graduados en Matemáticas, movilizados en dos encuentros de capacitación. Apoyados en la Educación en Matemática Crítica y el paradigma de investigación cualitativa, a través de procedimientos de análisis de contenido, identificamos cinco temas. El análisis de estos temas indica, como resultados, que los futuros docentes tienen conocimientos sobre Educación Financiera Escolar, a pesar de relacionar el tema con aspectos económicos y Matemática Financiera.

Palabras clave: Educación Matemática. Educación en Matemática Crítica. Educación Financiera. Licenciatura en Matemáticas. Formación de Profesores.

Reflexões de futuros professores de Matemática sobre Educação Financeira: perspectivas para a Educação Básica

Resumo: A Educação Financeira se tornou, a partir da publicação da Base Nacional Comum Curricular, um tema a ser desenvolvido em sala de aula, principalmente relacionado ao componente curricular Matemática. Nesse sentido, os professores ficam encarregados de sua abordagem. Diante disso, neste artigo, objetivamos discutir compreensões sobre Educação Financeira voltadas à Educação Básica e que foram produzidas por licenciandos(as) em Matemática, mobilizadas em dois encontros formativos. Amparados na Educação Matemática Crítica e no paradigma qualitativo de pesquisa, por meio de procedimentos da análise de conteúdo, identificamos cinco tópicos. A análise desses tópicos nos indica, como resultados,

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Received • 18/01/2024

Accepted • 24/04/2024

Published • 01/08/2024

Article

que os futuros professores apresentam conhecimentos da Educação Financeira Escolar, apesar de relacionarem a temática a aspectos econômicos e à Matemática Financeira.

Palavras-chave: Educação Matemática. Educação Matemática Crítica. Educação Financeira. Licenciatura em Matemática. Formação de Professores.

1 Initial considerations: from Financial Education to teacher training

In mid-2005, the Organization for Economic Cooperation and Development — OECD conceived the *Financial Education Project*. The aim was to identify and evaluate existing programs related to the subject in member countries, with a special focus on those aimed at education (OECD, 2005). Since then, Financial Education has acquired greater relevance in educational studies and legislative documents, promoting discussions about people's daily lives, including purchasing situations, the use of money and the consequences of consumption.

Regardless of the fact that Financial Education gained emphasis as a result of the recommendations made by the aforementioned organization, this topic was explicitly incorporated into the Basic Education curriculum in Brazil in 2018, with the implementation of the Base Nacional Comum Curricular [BNCC — National Common Curricular Base] (Brasil, 2017). In this respect, the BNCC represented a step forward in terms of incorporating Financial Education into the classroom (Giordano, Assis and Coutinho, 2019).

Although Financial Education is treated as a cross-cutting theme in the BNCC, the document instructs mathematics teachers to promote the topic in the classroom, based on the skills and competences of the area (Hartmann and Baroni, 2021). In view of this, based on a literature review of Brazilian research on Financial Education and Critical Mathematics Education, Hartmann and Maltempi (2022) observed that a large part of the productions focus on Financial Education in Basic Education, highlighting both the importance of the work of teachers in conducting the subject and the need to offer this subject in initial and continuing training courses.

In addition, Lima, Giordano and Sena (2021), when mapping the research on Financial Education discussed at the Encontro Brasileiro de Estudantes de Pós-Graduação em Educação Matemática (EBRAPEM — Brazilian Meeting of Postgraduate Students in Mathematics Education), from 2015 to 2019, found 34 texts on the topic in question. Of these, only three were dedicated to the training of teachers who teach mathematics. In this sense, considering the context of teacher training, the understanding of Financial Education that we corroborate is the one indicated by Baroni (2021)

a process of problematizing personal and collective financial life, with the aim of understanding and critically analyzing the financial world and its social, political and economic implications, with a view to transforming the mechanisms of economic dependence and social inequality. This process takes place through different analyses, including mathematics analysis aimed at developing financial literacy, as we understand it (p. 245-246).

Taking into account the perspective of Baroni (2021), the ideas of Lima, Giordano and Sena (2021) and those of Hartmann and Maltempi (2022), which indicate the need to promote and carry out discussions and research on Financial Education in teacher training spaces, we carried out a research, at the level of scientific initiation, with students from a Mathematics degree course at a public university in São Paulo. From this, we aimed to discuss understandings about Financial Education aimed at Basic Education, produced by mathematics undergraduates

and mobilized in two formative meetings.

In order to achieve this goal, we have organized the text into four main sections. In the next section, we establish the relationship between Financial Education and Critical Mathematics Education, since we adopt a critical, reflective, social and problematizing perspective on the subject. Next, we present the methodological considerations, the discussion of the data and the final considerations, followed by the bibliographical references.

2 Financial Education based on Critical Mathematics Education

In order to begin to establish the relationship between Financial Education and Critical Mathematics Education, let's look back at some of the considerations that have been present throughout the history of Financial Education. Worldwide, the recommendations made by the OECD (OECD, 2005) have contributed to the promotion of Financial Education. However, we disagree with the definition presented by the Organization, which emphasizes an idea of Financial Education related mainly to economic aspects and which brings us back to market and individualistic ideas in this area. This definition states that Financial Education is “the process by which financial consumers/investors improve their understanding of financial products, concepts and risks and” (OECD, 2005, p. 4).

This may suggest that citizens should be guided and informed to consume in the best possible way, a factor pointed out by Mazzi and Domingues (2021, p. 3), since these authors observed that the OECD's understanding of Financial Education expects people “not to question the world in which they live; not to problematize their realities and, furthermore, to contribute to the neoliberal machinery continuing to function”. Furthermore, one of the recommendations made by the OECD was that Financial Education should be started in schools. Considering this, we questioned whether it was the teacher's responsibility to “teach how to consume”, since this organization presents an economic and consumer view of Financial Education (Mazzi and Domingues, 2021, p. 3).

As stated in the introduction to this paper, we agree with the understanding of Financial Education presented by Baroni (2021). Among the guidelines produced by the author for promoting the theme are: *i*) broadening the area of reflection and instigating critical analysis of the financial world; *ii*) working with generating themes and seeking dialogue with other areas, favoring interdisciplinary actions; *iii*) prioritizing real problems, without limiting discussions; and *iv*) promoting reflection on working with Financial Education in Basic Education. The aspects pointed out by Baroni (2021) should be the subject of study in teacher training courses, since, in Brazil, the inclusion of Financial Education in the Basic Education curriculum occurred with the implementation of the BNCC (Brasil, 2017).

It is worth noting that studies by Hartmann and Baroni (2021) show that the BNCC emphasizes that the main person responsible for promoting the subject in the classroom is the mathematics teacher. Although Financial Education is mentioned as a cross-cutting theme in the document, the specific skills on this theme are presented in the areas of Mathematics (Primary Education) and Mathematics and its Technologies (Secondary Education). In this way, we understand the importance and urgency of mathematics teachers discussing, establishing relationships and taking a position on Financial Education, as well as questioning, in their studies and practices, the role of mathematics in this process. To this end, we understand the importance of having contact with Financial Education in their initial training.

In this context, the perspective of Financial Education and the notes produced by Silva and Powell (2013) have been considered, in the context of Mathematics Education, with a

critical bias. This is because these authors proposed a Financial Education curriculum aimed at Basic Education, using the term *School Financial Education* and indicating four axes to be explored, as follows: *i)* basic notions of finance and economics; *ii)* personal and family finances; *iii)* opportunities, risks and pitfalls in managing money in a consumer society; and *iv)* social, economic, political, cultural and psychological dimensions involving Financial Education.

In this respect, for example, the first and second strands include financial aspects such as: money and its role in society; notions of interest and investments; family planning and taxes. However, these aspects are expanded upon when Silva and Powell (2013) indicate, in axes three and four, possibilities for School Financial Education to discuss topics such as the risks of investments, the pitfalls of marketing, waste production and social inequality. In this way, the definition of Financial Education, from the perspective of these authors, points to a critical view in contrast to that presented by the OECD in 2005. The researchers emphasize that

the School Financial Education is a set of information through which students are introduced to the world of money and encouraged to produce an understanding of finance and economics, through a teaching process that enables them to analyze, make informed judgments, make decisions and take critical positions on financial issues that involve their personal lives, families and the society in which they live (Silva and Powell, 2013, p. 12-13).

Based on this perspective, we believe that the definition proposed by the authors allows us to make connections and reflections that go beyond an individualistic sphere and reach a collective and social notion. Furthermore, this view broadens the perception that Financial Education consists only of managing one's own money and organizing oneself financially. Still, in our view, the axes of School Financial Education, when interconnected, can be extremely relevant to the approach to the subject in Basic Education, since they contribute to a comprehensive and non-individualistic Financial Education. We agree with Mazzi and Domingues (2021, p. 05) when they state that “this proposal points to a Financial Education that considers aspects beyond financial products, but also emphasizes the importance of a critical discussion of real problems”.

Permeated by these considerations, we understand that the concept presented by Silva and Powell (2013, p. 13) can be related to the work of Critical Mathematics Education, since, by highlighting that there should be an incentive for students to be able to “take critical positions on financial issues that involve their personal lives, families and the society in which they live”, a mathematics can be raised. This concept is understood by Skovsmose (2014, p. 106) as a way of “reading and understanding the world through numbers and graphs, and writing it by being open to change”. In this way, we understand that Financial Education has the potential to play this role in relation to issues involving the financial world. It's not enough just to look at the numbers in Financial Mathematics, it's necessary to understand how they fit into society so that we can problematize Financial Education issues.

In addition, we advocate Financial Education practices that are theoretically grounded in Critical Mathematics Education. This precept is defended because we understand that working with learning environments — with references to Pure Mathematics, semi-reality and reality (Skovsmose, 2000) — especially scenarios for investigation, can contribute to its discussion. These scenarios are not just limited to mathematics content, as they can go much further, involving criticism, dialog and investigation. Even in scenarios for investigation, students are invited by the teacher to ask questions, test hypotheses, present reflections and seek

explanations. We understand that these aspects are conducive to problematizing, dialogic and socially-oriented Financial Education. Table 1 illustrates the proposal for the six learning environments:

Table 1: Learning Environments

	Exercises	Research scenarios
References to Pure Mathematics	(1)	(2)
References to semi-reality	(3)	(4)
References to reality	(5)	(6)

Source: Skovsmose (2008, p. 23)

Furthermore, in the research scenarios, especially in environment (6), real problems are considered and serve as guidelines for the discussions raised. These characteristics contribute to research scenarios being made up of dialog and research. However, according to Skovsmose (2000), the scenarios only become research scenarios if the students accept the invitation and, for this to happen, the problems involved must be recognized as their own. In this way, we agree with Baroni (2021) when he states that this approach “is present in this process in which new perspectives come into play, through the critical analysis of the social issues that permeate financial problems, provoking reflections and, possibly, engagements to tackle these problems” (Baroni, 2021, p. 82).

Considering the learning environments, number 1 stands out for Pure Mathematics exercises, while 2 involves more exploratory, critical and dialogical activities, including investigation. In the context of Financial Education, Baroni (2021) mentions that 1 focuses on calculations and algebraic studies, while environment 2 can cover the history of Financial Mathematics and discussions about coefficients for simulations, for example.

The type 3 environment incorporates semi-reality exercises, such as problems involving product prices, offering a single correct answer. This one, although related to the financial market, explicitly lacks critical moments, action and investigation. The 4th environment proposes explorations and explanations, generally involving research, criticality and dialog. The 5th environment can represent students' real-life situations, but still focuses on exercises. Finally, the 6th environment encourages calculations related to real-life situations, promoting research, dialog and criticality, especially through projects.

To expand on the possibilities outlined so far, which cover aspects of Financial Education and Critical Mathematics Education, we refer to the research by Muniz Jr. (2016), in which the author developed activities within the scope of School Financial Education, highlighting the relevance of this field in the process of citizen education. In addition, the author considers that School Financial Education Environments¹ can be set up in various spaces, such as classes, academic research, seminars, lectures and teacher training. (2016) proposes five non-mathematical aspects that can be taken into account when making decisions in financial situations: cultural, financial, economic, social and behavioral.

Hartmann, Mariani and Maltempo (2021) analyzed some activities, considering the non-mathematics aspects proposed by Muniz Jr. (2016), and synthesized three descriptors. The first of these, Context Interpretation, “relates to the way in which the question is announced, in order

¹ School Financial Education environments are created “when teachers, students and/or researchers invite teachers, students and/or researchers to think about financial issues that involve mathematics ideas, but are not limited to them” (Muniz Jr. and Jurkiewicz, 2016, p. 83).

to allow individuals to identify a cohesive and coherent context, through a financial situation that incorporates mathematics and non-mathematics elements” (Hartmann; Mariani; Maltempi, 2021, p. 576). This descriptor is in line with Critical Mathematics Education, since the activities must be relevant to the students and their interests and also promote real-life reflections (Skovsmose, 2014).

Furthermore, the second descriptor pointed out by Hartmann, Mariani and Maltempi (2021) is *Decision Making*, in which the authors agree with Skovsmose (2007, p. 132), who indicates that decision-making is “a new scene where mathematics and power interact, and an important aspect of this interaction is the elimination of what could be called the human factor. A human being can feel sorry or angry and this can influence their decision”. Finally, the third descriptor created is *Argument in Decision Making*, which refers to the mathematical and non-mathematical aspects that mobilize thinking and decision-making in the financial world.

If didactic activities on Financial Education are approached using the three descriptors, for example, the ideas raised by the students can be related to mathematics in action (Skovsmose, 2008). According to the author, this concept values the social role of mathematics, which is a relevant factor in discussions about financial life. This idea is also addressed in the research by Baroni and Maltempi (2021). For Skovsmose (2008), mathematics can establish economic procedures and decision-making

by mathematics in action, I mean those practices that include mathematics as a constituent part of themselves, e.g. technological innovation, production, automation, management and decision-making, financial transactions, risk estimation, cost-benefit analysis, etc. Such practices contain within them actions based on mathematics that can be food for thought (p. 52).

The aspects pointed out by Skovsmose (2008) allow us to see the potential for connecting Financial Education with the development of critical attitudes, for example, on the goods and bads of technological innovations. In addition, sub-themes of Financial Education can be raised through relationships with Critical Mathematics Education and other theoretical-methodological trends in Mathematics Education, such as Mathematical Modeling. This is because, as an example, for Barbosa, Araújo and Paes (2020), Mathematical Modelling, articulated with Financial Education, is capable of arousing criticality in relation to consumerism and the various social inequalities that affect Brazil, by problematizing the socio-cultural role of mathematics. The aforementioned authors developed activities with 15 students from a pre-university course, from the perspective of Mathematical Modeling and with reflections that instigate Financial Education, addressing topics such as consumption and finance, household budget and compound interest.

Thus, we corroborate Kistemann Jr. and Xisto's (2022, p. 47) defense of the idea of Critical Mathematics Education, which can be “considered one in which teachers and students unite in the educational process through dialogue, with the aim of improving the democratization of knowledge, valuing mathematical learning”. This involves concerns about “citizenship, social justice, criticality and inclusion, as well as emphasizing the importance of developing a critical environment in student actions mediated by a mathematics educator” (Kistemann Jr. and Xisto, 2022, p. 47-48).

3 Methodological considerations

This paper is based on the qualitative research approach, which allows us to understand,

interpret and discuss the phenomena studied from the perspectives of the research participants. We corroborate Lüdke and André's (1986) statement about qualitative research: “concern with the process is much greater than with the product. The researcher's interest when studying a particular problem is to see how it manifests itself in everyday activities, procedures and interactions” (Lüdke and André, 1986, p. 12). In this way, we recognize the importance of understanding how teachers in training perceive Financial Education, reflecting on pedagogical strategies appropriate to the context of Basic Education, in order to promote a meaningful, reflective dialogue that highlights critical aspects of the subject.

To achieve the objective proposed in our study, we developed a didactic activity on Financial Education, carried out in two formative meetings, with the participation of 11 mathematics undergraduates² from a public university in São Paulo. In this context, reflections, ideas and hypotheses were raised about the role of mathematics teachers when approaching Financial Education in Basic Education, as well as the relevance of contact with this theme in their initial training. To achieve this, the participants discussed issues related to their training and their understanding of Financial Education, as well as analyzing exercises from textbooks that dealt with the subject. Some of the proposals for these activities are shown in Figure 1.

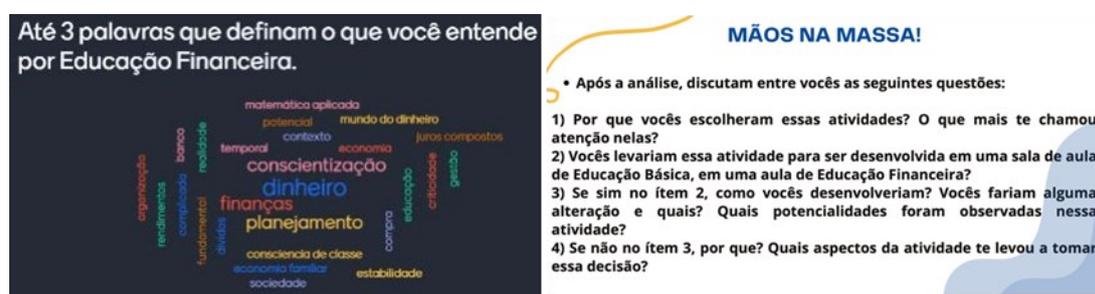


Figure 1: Support material for training meetings with mathematics undergraduates (Authors, based on research data).

In this context, two methodological procedures were used to record the data: *i*) audio recordings of the meetings; and *ii*) writing field diaries. Both strategies made it possible to capture the interactions, dialogues and debates that took place during the training meetings, enabling us to carry out a detailed analysis of the discourses and exchanges of knowledge between the participants. Thus, while the recordings were important for recording moments of reflection and collective construction of knowledge, the field diaries were used as a complementary annotation tool.

Finally, we would like to point out that the data analysis was conducted using Content Analysis techniques (Bardin, 2016), especially its three main phases: pre-analysis, exploration of the material and treatment of the results and interpretation. In this study, pre-analysis involved preparing and holding meetings with the students. The exploration of the material was made possible by transcribing the audio recordings of the meetings, reading and analyzing this data, plus the notes recorded in the field diary produced by the main researcher. In addition, at this stage, we carried out coding, which consists of the “transformation [...] of the raw data of the text, a transformation which, by cutting, aggregation and enumeration, makes it possible to achieve a representation of the content or its expression” (Bardin, 2016, p. 132).

Thus, coding allowed us to observe five main themes highlighted in the study, namely:

² In order to guarantee the anonymity of the participants, we have used pseudonyms when mentioning excerpts produced by them: Thomaz, Ny, Janaina, Peralta, Pedrinho, Hamilton, Helena, Marildinha, Paiva, Hipátia and Beatriz.

associations between Financial Education and Financial Mathematics; Financial Education and the Mathematics teacher; axes of School Financial Education; Financial Education related to economic aspects; and the approach to Financial Education in Basic Education. Finally, based on these topics, we move on to the results processing and interpretation phase. This phase involves analyzing and explaining the results, in which we create dialogues between the data and the theoretical references. The third phase of content analysis is detailed in the next section.

4 Discussion of the data: relationships between Financial Education and the school environment mobilized by mathematics undergraduates

In this section, the reflections of future mathematics teachers that will be presented are related to the perspective of Financial Education. Thus, we seek to promote dialogues and considerations about how Financial Education can manifest itself in their training and in their future practice as mathematics teachers.

Firstly, we would like to highlight the questions the participants were asked about the relevance of Financial Education in their professional lives. We noticed that Helena and Hipátia presented memories related to purchasing situations and indicated the need for teacher training so that there are activities that address the decision-making process and provide social discussions. These thoughts can be complemented by Peralta's excerpt:

Peralta — Having this base, having this diversity of stories that we carry with us, of contacts that we have, really helps us to think about their [the students'] reality, because it really is something that sometimes if we were on a different path or in a place where this isn't discussed as much, if we didn't have a discipline³ for this, if we didn't have meetings, if we didn't have other work, we wouldn't know how to cover it as much and we'd just stick to the material [...] I think it's very much a question of knowing how to not only follow the script, but adapt it. We know that most of the places we're going to perform, we're going to have didactic material that most of the time needs to be followed. We have to follow it. So it would be part of, for example, this [exercise] on the fridge⁴, for us to know what discussion to bring. Unlike just going over what's on the paper, that's it, fine, let's move on to the next one. Because as we said last week, many of the discussions they bring up are more about financial mathematics, calculating things, knowing how to calculate interest. There's no question of class consciousness, nothing like that, no social questioning. And we need this kind of training [...]

In this way, we can see that, in the participant's speech, *the figure of the mathematics teacher* acquires central importance in Financial Education practices, highlighting the importance of mediating and adapting the content to the reality of the classroom. In her initial training, she points out that discussions and shared stories influence the approach to the subject in the classroom, emphasizing the complexity of the teaching role and indicating the need to go beyond the standard scripts of teaching materials, adapting them in depth. Thus, Peralta points to the primordially of carrying out practices that transcend Financial Mathematics, in order to integrate elements of class awareness and social questioning, which are often secondary in traditional Financial Education teachings.

This suggests a critique of the exclusive focus on Financial Mathematics and highlights the importance of considering social, political and cultural dimensions in the work of Financial Education, in line with the purpose of Critical Mathematics Education. For Skovsmose (2000), this theory emphasizes that mathematics is not just a subject to be taught and learned, but a

³ At the institution where the research was carried out, the students have a specific subject in Financial Education in the second semester of the first year of their degree in Mathematics.

⁴ See Figure 2 shown in the analysis in this section.

topic that needs to be reflected upon.

With this, we reinforce the central idea that unifies Critical Mathematics Education, which argues: “for education, both as practice and as research, to be critical, it must discuss basic conditions for obtaining knowledge, it must be aware of social problems, inequalities, suppression, etc. [...]” (Skovsmose, 2001, p. 101). This concept brings us back to a political concern with mathematics education.

Based on this, we refer to Hartmann and Maltempi (2022), who argue that, by defending a Financial Education that reflects broad themes that reach a collective scope, such as poor income distribution — which can raise issues of class consciousness — then Peralta's conception, which converges with ours of Financial Education, encompasses issues of Critical Mathematics Education.

When dealing with the possible *associations between Financial Education and Financial Mathematics*, the participants in the study pointed out connections between the two, mainly indicating that the work with the two themes is related to aspects of everyday life, such as the functioning of banks, compound interest calculations, credit analysis and other financial operations. However, the participants' statements suggest that their practice is mostly centered on mathematics. Despite this, it was also possible to see excerpts that reinforce the importance of a broad and integrative approach to teaching Financial Education, which goes beyond mathematics formulas and promotes a critical and contextualized understanding of financial practices. This encourages awareness of the complexities of the financial system and its interactions with the wider social context. These factors can be seen in the following excerpt:

Thomaz — *I think that Financial Education combines financial mathematics with a context that is more applied to the individual's life. So it has applied mathematics, but related to an awareness of how, for example, a bank works, how compound interest works, how it's written, the issue of credit [...]. At the time we took Financial Education, I thought it was the same thing as Financial Mathematics. I thought it was going to be the same thing. That we'd learn the formulas, as we're undergraduates, we'd probably deduce the formula, and then we'd do exercises for the exam, exercises for this. And that's not what the course was about. It wasn't just that, it went beyond that. So that surprised me too.*

In view of this, Thomaz highlights an initial perception of Financial Education as resembling traditional Financial Mathematics, based only on formulas and calculations, which can be associated with the exercise paradigm (Skovsmose, 2000). However, he noted that the subject went beyond conventional approaches, promoting a broader and more contextualized understanding of financial and social issues.

These points are also made in the studies by Pessoa and Muniz Jr. (2021), which address publications involving School Financial Education, indicating a nature of the subject connected to different areas, one of which is Financial Mathematics, but which goes beyond this, as evidenced by the discussion of aspects of Sociology, Politics and Anthropology.

In this paradigm, the authors indicate that Financial Education at school allows reflection on critical socioeconomic issues, such as: labor changes in Brazil; income generation; social inequality; financial planning; responsible consumption; housing for all, considering cultural, social and family contexts (Pessoa; Muniz Jr., 2021). In addition to the aspects presented by Thomaz, we highlight Hipátia's comments:

Hipátia — *When I was thinking about the words⁵, a lot of financial mathematics was coming up, because I think it's part of Financial Education that you know how to operate mathematically with the concepts, so compound interest, you calculate interest, you understand what amount is, you understand what capital is, and I also think awareness and society are part of it, and then class awareness came up, which I also think is very important, and involves this, which is the other aspect that Financial Education is going to work on, which is what you yourself were also talking about, which is awareness of the kind, you understand financial operations and how society works in terms of, let's say, money.*

Based on what Hipátia and Thomaz said, we can see that these participants reveal the importance of integrating Financial Mathematics as part of Financial Education, but also of going beyond teaching purely technical mathematical concepts. They emphasized the need to raise awareness about how society works in relation to money and the economy, highlighting the importance of considering socio-economic and political aspects in the context of teaching Financial Education. In relation to the need to consider political aspects in this context, a factor pointed out by the participants, we highlight that the idea of Critical Mathematics Education arose from Skovsmose's concerns with the political aspects of the area (Borba, 2001).

Thus, we agree with Baroni and Maltempi (2021) when they point out that considerations about the operation of the financial system and the impact of consumption on society demand a pedagogical approach that goes beyond numerical and isolated analyses of contemporary social dilemmas, particularly the issue of community indebtedness, resulting from excessive consumption, increasingly based on credit. In this way, mathematics can serve both to legitimize consumption practices and to question them, with a view to a critical analysis of reality. The latter can be achieved through a *matemacia* of consumption (Skovsmose, 2014), when we seek to understand the financial world and are open to criticism and, consequently, change.

Therefore, as pointed out in Thomaz's speech, previous understandings of Financial Mathematics and Financial Education indicate that these themes can be understood as synonyms. We emphasize that Financial Education goes far beyond Financial Mathematics, although there are some interconnections. We understand that Financial Education raises mathematical — including Financial Mathematics — and non-mathematical discussions, such as cultural, social and behavioral aspects (Muniz Jr., 2016), encompassing considerations from the various areas of school curricula. As Baroni (2021) shows us, the universe of Financial Education has relations with Financial Mathematics, but is not limited to this, incorporating aspects of Psychology, Pedagogy, Sociology, Environmental Education and Philosophy, for example.

In line with the above, another point to be considered refers to the contents of Financial Mathematics that are used in daily financial operations, such as financing and loans (uniform periodic series); interest calculations (simple and compound interest); debt repayment (amortization systems); discounts and additions to purchases (percentages). These elements can contribute to the economic vision associated with Financial Education, a discussion raised in our study when the participants addressed debates regarding Financial Education and its economic aspects in the teaching context.

During the first stage of the training meetings, which explored the prospective teachers' perceptions of Financial Education, most of the participants *associated terms related to a marketing perspective with Financial Education*, in line with the observations of the OECD

⁵ As shown in Figure 1, image on the left, the study participants were asked to associate their understanding of Financial Education with three words.

(2005). This is explicit in some of the statements collected at the meetings, as shown below:

Marildinha — *I put [referring to the activity of associating three words with the understanding of Financial Education] money, stability and management, which in my mind is Financial Education, financial, money. And then money, we want to learn, to have stability, so we have to manage something in a certain way.*

Beatriz — *I put [referring to the activity of associating three words with the understanding of Financial Education] what came first in my mind, as you said, so I put debt, bank and planning. Debt, because if I compare what I had when I did the subject with you⁶, Financial Education with Andrei, with now, I've learned about credit cards and then debt. And then debt, as money is related to the bank, because if it wasn't for the bank, there wouldn't be credit cards, there wouldn't be debt. And planning precisely to adapt to this and learn how to control this and how not to create these debts has to be something we have to have from a very young age.*

The reflections shared by Marildinha and Beatriz illustrate an initial understanding of Financial Education that is directly linked to personal money management, understanding debts and financial planning. This perspective may indicate a view of Financial Education in which the focus is on the control and management of individual finances, aligned with the context of consumption and the functioning of the banking system. Thus, it is notable that, in establishing these relationships, the participants recognize the importance of practical skills and knowledge about the functioning of the financial system for their contexts. However, it is important to consider that Financial Education should not be limited to these notions alone, but should also promote a critical understanding of financial dynamics and their social implications.

In this context, when students claim that, for them, the discussion of Financial Education relates to situations of planning and consumption, a *matemacia* of consuming can be raised, since, for Skovsmose (2014, p. 110), “Mathematics Education is also concerned with preparation for consumption, and we can reflect on social responsiveness in this case”. In addition, the *matemacia* is mobilized by the author, and can involve acts to criticize the goods and evils of consumption, and is linked to aspects of social responsibility, which encompass actions that promote understanding of the social, political, cultural and economic contexts of individual experiences, as well as practical strategies to drive concrete changes in the world. In line with the above, we can relate it to what Skovsmose (2007) says about decision-making, as already discussed, being a crucial point for promoting environments that discuss planning and consumption.

The considerations raised indicate that economic aspects are present in discussions of Financial Education, as in the first axis of School Financial Education (Silva; Powell, 2013), which seeks to address basic notions of Finance and Economics. In this axis, for example, discussions are proposed around money in society, the relationship between money and time, the notions of interest, savings, inflation and financial investments. In this context, we observed comments made by the participants that referred to this perspective. At first, Helena highlighted her vision of Financial Education and demonstrated knowledge about this framework, which may have emerged from her studies on Financial Education and her experiences in the subject offered by the mathematics course.

Helena — *It comes from this idea of bringing everything together, so from simpler things like this, for*

⁶ Referring to the second author of this text who accompanied the production of data from the scientific initiation, the results of which culminated in the production of this paper.

example, in the first axis of Silva and Powell⁷, which brings this financial mathematics that is with simple interest, compound interest, you know the initial operations, bringing to the second axis, which brings a bit of family income, planning, taking to the third axis which is investments, care with marketing in society, so this world of money involves this and leading up to the fourth axis which is personally, my favorite, that of criticality, which is Financial Education outside the classroom as well.

With this in mind, we invited the other participants in the training meetings to analyze exercises in textbooks on Financial Education. Some of the exercises analyzed are shown in Figure 2.

No contexto

Converse com seus familiares e, da maneira que preferir, registre as receitas e despesas de sua família. Quais despesas comprometem a maior parte das receitas: as fixas, as variáveis ou as extras? Em sua opinião, é necessário tomar alguma providência para reduzir essas despesas? *Resposta pessoal.*

5 Na compra de uma embalagem com dois desodorantes, um supermercado oferece a seguinte promoção.



Se um desodorante custa R\$ 15,60, quantos reais uma pessoa pagará se comprar, nessa promoção, duas dessas embalagens? **R\$ 43,68**

5 Em certa loja, Daniele comprou o refrigerador indicado no cartaz em duas parcelas iguais de R\$ 1 100,00: a 1ª no ato da compra, e a 2ª após 30 dias, acrescida de juro.



a) Qual é a taxa de juro mensal cobrada por essa loja? 10% a.m.
b) Quantos reais Daniele economizaria se pagasse o valor total à vista, sabendo que nessa modalidade de pagamento a loja ainda concede ao consumidor 8% de desconto sobre o preço do cartaz? **R\$ 268,00**

Figure 2: Textbook activities analyzed by the mathematics undergraduates in the training meetings (Authors, based on exercises by Teixeira, 2020).

We agree with Marim and Silva (2020, p. 24) when they point out that “the textbook currently does not only deal with the specific content of school subjects, but also with the development of the student as an active social being in society, proposing and encouraging social coexistence”. Some of the exercises involving buying and decision-making caught the attention of the students (as in Figure 2), who made reflections and criticisms on the subject, as shown below:

Helena — *The one about the deodorant, which is that capitalism trumps everything in our current society, which is basically “If you buy one, the second one is 60% off and then you get 4 deodorants” and then because you want 4 deodorants at once, you know? You don’t have to, you can take just one, but to take advantage of that discount, it’s like this [...] This deodorant one, as we mentioned last week, you buy a pair of deodorants and when you buy the second pair you get 60% off. And then the question was why I had to have four deodorants in my... In my closet? A hint by any chance? And there’s a lot of this thing*

⁷ We should point out that Helena had studied Financial Education as an undergraduate, in which Silva and Powell’s (2013) conception of School Financial Education was addressed.

where people kind of force you to have things that sometimes you don't need, or sometimes you force yourself to have things that theoretically you wouldn't need. Silva & Powell even brings up the problem of need versus desire, that sometimes I don't need 4 deodorants, but the 60% discount makes me want to have 4 deodorants.

Considering the excerpt, we observe an intertwining between Helena's statements and the third axis of School Financial Education, which requires students to reflect on “investment opportunities; the risks of investing money; the consumption traps behind marketing strategies and how the media encourages people to consume” (Silva, Powell and 2013, p. 14). This can be seen when the participant judges the inducement to excessive consumption based on promotions such as “take two, get a discount”, a factor that can allow students to interpret the context (Hartmann, Mariani and Maltempo, 2021), since it is directly related to everyday situations. This criticism resonates with the discussion proposed by Silva and Powell (2013) about the risks involved in marketing strategies that can lead to disadvantageous financial decisions.

Furthermore, the fourth axis, which deals with the social, economic, political, cultural and psychological dimensions surrounding Financial Education, emerges in Helena's speech when she mentions the problem of need *versus* desire. She highlights the social and psychological pressure exerted by attractive offers that often lead people to buy more than they really need. Criticism of consumerism and reflection on ethics and money are implicitly present in this passage.

We also reiterate the studies by Pessoa and Muniz Jr. (2021), since these authors advocate a Financial Education practice that connects with different areas, in addition to Financial Mathematics. This is also highlighted by Marim and Silva (2020) when they criticize the fact that high school mathematics textbooks, which they analyzed, lead only to an approach to Financial Mathematics, and not to broader aspects of Financial Education. In this sense, we highlight Hipátia's speech, as she points out that Financial Education “lacks” debates in this area:

Hipátia — The point I wanted to touch on is exactly the last part of Helena's speech, which is how are you going to educate these students? So, well, it's important that we educate ourselves financially, so that we don't get into debt and so that we manage our money in a certain way. But, well, I'm not getting into debt, I'm not losing money or anything, but what am I doing? Oh, I'm going back to consumerism, to “Oh, I want to buy, I'm going to buy” and I'm disregarding all the factors of consumerism, the environmental discussions as well, the effects of consumerism on the environment, so I think Financial Education is still a little lacking in this part of the discussion.

The future educator highlights a relevant dimension that transcends individual financial management. She reflects on the importance of a more comprehensive approach to Financial Education, which is not limited to debt prevention and money management, emphasizing the need to incorporate discussions on consumerism, the environment and its consequences. Thus, in addition to being related to the first and second axes proposed by Silva and Powell (2013), which discuss the importance of basic notions of finance and economics and financial and family planning, they are also aligned with the fourth axis, which seeks to address Financial Education from a critical perspective.

In addition, Hipátia's critique reinforces the importance of addressing not only the practical and individual issues of money in basic education, but also the social and environmental implications of financial choices. *The four axes of School Financial Education*

are a strong possibility for a broad understanding of Financial Education. By seeking to incorporate these axes into the teaching of Financial Education, Basic Education can contribute both to the formation of financially aware individuals and to the construction of critical and ethical citizens.

In light of this, we would like to highlight the statements made by some participants about their experiences *in approaching Financial Education in Basic Education*. Criticism focuses on the individualistic and sometimes decontextualized view of Financial Education, which can result in a practice that is related to the definition of the OECD (2005), in which teachers possibly play the role of teaching students to consume in the best possible way in the capitalist society in which they are inserted.

Peralta — Because in the [Pedagogical]⁸ Residency I follow, I think I follow two of the four itinerary⁹ classes. So I don't follow all of them, so obviously I don't know what happens in full, but I realize that what they're taught isn't this vision of social criticism, focused on criticism, it's actually more focused on financial mathematics, but in any case, at least what I see, it's not decontextualized. They bring it up, they explain a lot about everyday tools to them, but the intention isn't to encourage these discussions. It's really something more like this, not expansive in terms of society, but like, how you can manage your [...] It doesn't fulfill this purpose, this potential, which could be social criticism. So, I understand that we want to reverse this and maybe at our level it's easier to bring up this kind of issue, but I see that what is in the itinerary presented to them is not this part of social criticism

Thomaz — It makes sense to include things that they're going to have to deal with in adulthood, which is buying, paying in installments, having to pay for things over the long term, not putting an amount of money into an investment at the bank, you know?

Helena — This one [referring to the “In context” exercise shown in Figure 02] is very much an exercise that's at the end of the Financial Education chapter, in which if you want to see more, this exercise is here. Sometimes it just passes, you know? So I feel it has the potential to work for more than one class, a semester, but people leave it...

The analysis of the participants' speeches shows the predominant perspective of an approach focused on Financial Mathematics in Basic Education, with an emphasis on the practical and everyday aspects of finance. Thus, based on Baroni's (2021) guidelines, we observed that the data presented converges with the ideas of valuing financial life in context, in order to promote a critical and comprehensive understanding of the subject. This is evidenced by Peralta and Thomaz's statements, which suggest that the focus is mainly on the application of day-to-day financial tools, such as resource management and practical aspects of installments and long-term payments.

With this, the excerpts indicate a convergence with the ideas of Baroni (2021) in highlighting the limitation of current approaches, which prioritize technical aspects to the detriment of a deeper social analysis. These aspects seem to be disconnected from a critical social perspective, as emphasized by Peralta when she points out that the itinerary she is following does not encourage expanded discussions on social issues. In addition, the student highlights the absence of a critical social vision in the teaching of Financial Mathematics, indicating the need for a broader approach that promotes reflection on the underlying social structures. As we have already discussed, we understand that Financial Education can have the

⁸ Pedagogical Residency program, sponsored by the Coordination for the Improvement of Higher Education Personnel (Capes).

⁹ Formative itinerary, which represents a set of subjects or projects that high school students in Brazil choose to do (Brasil, 2017). As examples, we cite the *Financial Education* and *Logical Connections* training itineraries, which exist in schools in the state of São Paulo.

role of promoting *matemacia* (Skovsmose, 2014), a concept linked to reading the world through mathematics.

In addition, Helena's statement indicates the possibility that, although there is potential to deepen the content of Financial Education over the course of a semester or more, the lack of training, initial or continuing, and superficiality often prevail in the teaching of this subject. This reinforces the importance of the possibilities raised in Baroni's (2021) studies, which emphasize the need for a dialogical and contextualized approach, capable of promoting a critical understanding of the relationships between the financial universe and the environment, thus contributing to broader social transformation. We would also like to highlight work with scenarios for investigation (Skovsmose, 2000), which may be able to address Financial Education through projects proposed to students, in which they are led to investigate problems they consider their own.

From this point of view, we highlight the need to discuss Financial Education not only in the individual sphere, but also from a family and social perspective, critically looking at financial practices, which can be done through Silva and Powell's (2013) understanding of School Financial Education, which converges with the ideas of Critical Mathematics Education (Skovsmose, 2000, 2001, 2008, 2014).

We agree with Mazzi and Baroni (2021) when they state that this definition presents essential elements to be considered when analyzing the Financial Education of future mathematics teachers, including a focus on integrating the individual into the financial context and encouraging critical and informed reflection on relevant monetary issues, paving the way for a perspective that is not only personal, but also social.

5 Final considerations

In this text, we aim to discuss understandings about Financial Education aimed at Basic Education, produced by mathematics undergraduates and mobilized in two formative meetings. To do this, we used two meetings with 11 students from a mathematics degree course at a public university in São Paulo as a setting.

Given that this was an undergraduate study, we were limited by the time it took to produce the data, which was done in just two meetings. Despite the short period for generating data, all the participants in the study already had some contact with Financial Mathematics and/or Financial Education. We recognize that similar studies could be conducted with students who had no prior understanding of the topics covered. In the general context, the data showed five themes: associations between Financial Education and Financial Mathematics; Financial Education and the Mathematics teacher; axes of School Financial Education, Financial Education related to economic aspects; and the approach to Financial Education in Basic Education.

We can see that Financial Education practices are associated with economic aspects and Financial Mathematics, a factor that needs to be expanded. This may be due to the fact that the activities in textbooks are more related to exercise and semi-reality situations, while there is a lack of clear guidelines in the manuals for teachers (Azevedo and Pessoa, 2020), as well as initial and continuing training. We advocate a Financial Education perspective that is aligned with Critical Mathematics Education and the other references mentioned throughout the text, which problematize non-mathematical issues, such as social, economic and environmental problems, in a transversal way.

As explained by the undergraduates participating in the study, the axes of School

Financial Education (Silva and Powell, 2013) can allow for broad views of topics associated with the subject, breaking with its sole link to Financial Mathematics. There is still much to be done to approach Financial Education in the way we advocate in Basic Education, but we understand that progress is already being made, such as the inclusion of this theme in the curriculum, through the BNCC, which requires us to think about the initial and continuing training of teachers. In this context, we would like to point out that research could be carried out with practicing teachers, with a view to understanding their understanding and effective practices for including discussions of Financial Education in Basic Education.

In this sense, through the studies of Skovsmose (2000, 2001, 2008, 2014), we emphasize the need for an understanding of Financial Education articulated with the principles of Critical Mathematics Education. It is essential to emphasize the importance of incorporating social aspects into the curriculum of initial training for mathematics teachers, providing them with the necessary resources and bases to guide the teaching of Financial Education in a manner consistent with the desired ideals. In this way, future educators will be able to promote broader discussions and practices that go beyond financial concepts and calculations, emphasizing critical awareness of society in a gradual way, as well as understanding the socio-economic impacts on their future classrooms, going beyond the physical walls of the school space. In addition, we extend these reflections to educators already working, encouraging them to update their reflections and practices.

Acknowledgements

São Paulo Research Foundation (Fapesp — *Fundação de Amparo à Pesquisa do Estado de São Paulo*) — processes n. 2022/13519-3, n. 2021/11937-0 and n. 2023/02251-2.

Note

The translation of this paper from Portuguese into English was funded by the Minas Gerais State Research Foundation (Fapemig — *Fundação de Amparo à Pesquisa do Estado de Minas Gerais*), under Call for Proposals 8/2023.

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