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Educação Matemática Debate

Proposals for Financial Education activities based on Critical Mathematics Education

Abstract: Financial Education can be understood as a set of concepts and has been included in school curricula. Reflecting on its importance and looking for ways to approach it in the school environment, a pedagogical notebook was produced. The aim of this paper is therefore to present the evaluation of this material, carried out by teachers who analyzed the activities and learning environments proposed. It was noted that they have the potential to become scenarios for research involving Financial Education with a theoretical basis in Educação Matemática Crítica (Critical Mathematics Education — EMC). The research is characterized as qualitative and the content analysis described by Gomes (2016) was used to interpret the data. The results show that, although challenging, it is possible to develop teaching materials based on EMC.

Keywords: Financial Education. Critical Mathematics Education. Scenarios for Investigation. Pedagogical Materials.

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Article

Propuestas de actividades que abordan la Educación Financiera desde la Educación en Matemática Crítica

Resumen: La Educación Financiera puede entenderse como un conjunto de conceptos y ha sido incluida en los currículos escolares. Reflexionando sobre su importancia y buscando posibles abordajes en el ámbito escolar, se elaboró un cuaderno pedagógico. Por lo tanto, el objetivo de este artículo es presentar la evaluación de este material realizada por docentes, quienes analizaron las actividades y ambientes de aprendizaje propuestos en él, observando el potencial de convertirse en escenarios de investigación, involucrando a la Educación Financiera con una base teórica en Educación Crítica. Matemáticas — EMC. La investigación se caracteriza por ser cualitativa y para analizar los datos se utilizó el análisis de contenido descrito por Gomes (2016). Los resultados encontrados demuestran que, a pesar de ser un desafío, es posible desarrollar materiales didácticos basados en EMC.

Palabras clave: Educación Financiera. Educación Matemática Crítica. Escenarios de Investigación. Materiales Pedagógicos.

Propostas de atividades abordando Educação Financeira a partir da Educação Matemática Crítica

Resumo: A Educação Financeira pode ser compreendida como um conjunto de conceitos e tem sido inserida nos currículos escolares. Ao refletir sobre sua importância e buscando possibilidades de abordagem no ambiente escolar, foi produzido um caderno pedagógico. Dessa forma, o objetivo deste artigo é apresentar a avaliação do material mencionado, realizada por professores que analisaram as atividades e os ambientes de aprendizagem propostos. Foi observado o potencial para se tornarem cenários para investigação, envolvendo a Educação Financeira com embasamento teórico da Educação Matemática Crítica — EMC. A pesquisa caracteriza-se como qualitativa e, para a interpretação dos dados, foi utilizada a análise de conteúdo, descrita por Gomes (2016). Os resultados demostram que, apesar de desafiador, é possível o desenvolvimento de materiais pedagógicos baseados na EMC.

Palavras-chave: Educação Financeira. Educação Matemática Crítica. Cenários para

Investigação. Materiais Pedagógicos.

1 Introduction

Financial Education is a topic that has been debated in society for some years and is increasingly being included in school curricula and education systems. Initially treated as a Cross-Cutting Theme, Financial Education has the potential to develop ideas and behaviors capable of influencing society as a whole (Cordeiro, Costa and Silva, 2018).

Financial Education is a set of concepts and procedures that aims to teach about financial products and services, in order to help citizens make choices in relation to monetary issues that significantly impact their lives (Organization for Economic Cooperation and Development [OECD], 2005).

Given the importance of this subject and its increasing inclusion in curricula (Marim and Silva, 2020), it is essential to observe how its concepts are presented to students, in order to make their learning more effective and concrete. It is known that, most of the time, the approach to Financial Education is left solely to the teacher and their interests, without giving students the opportunity to decide what they would like to learn. Furthermore, the presentation is only concerned with situations defined by the textbooks, without the possibility of discussion and reflection on the proposed content, without having a relevant impact on the students' lives.

According to the Organization for Economic Cooperation and Development [OECD] (2005, p. 6), "Financial Education should start at school. People should be educated about financial issues as early as possible in their lives". Based on this statement, it can be said that Financial Education should be presented at school in a systematic way, at different levels of education, seeking effective student learning through different strategies.

Reflecting on the need to provide students with the opportunity to learn Financial Education, it is important for teachers to build and explore spaces with students for socializing knowledge, using open-ended materials and situations (Barbosa, Araújo and Paes, 2020). Material that contains models of real situations, with activities based on themes that are relevant to society, allowing for reflection and the raising of hypotheses, enabling students to understand the social process in question. This approach also allows teachers and students to change the course of the teaching and learning process (Skovsmose, 2001).

Therefore, the production of teaching materials involving Financial Education is a necessity. However, in order to provide differentiated learning environments, these materials must be built from perspectives that allow for the development of both the subject and student autonomy, enabling them to participate effectively. Trends in Mathematics Education can be used to achieve this.

Trends in Mathematics Education are considered important movements for the development of different methodologies and approaches to pedagogical practice in order to improve mathematics teaching, teacher training and promote learning in the subject (Zorzan, 2007).

Thus, the aim of this paper[1] is to present the evaluation of a pedagogical notebook,

[1] This paper is an excerpt from a dissertation defended in the Postgraduate Program in Science, Mathematics and Technology Teaching (PPGECMT), at the Universidade do Estado de Santa Catarina (State University of Santa Catarina — UDESC), authored by the first author and supervised by the second author. The research was approved by the Ethics Committee with opinion number 3.968.967, with approval date on April 14, 2020 and CAAE: 56427016.0.0000.0118.

carried out by mathematics teachers, who analyzed the activities and learning environments proposed. In turn, these activities and learning environments have the potential to become scenarios for investigation, involving the theme of Financial Education as a theoretical basis for Educação Matemática Crítica (Critical Mathematics Education — EMC). The pedagogical notebook, entitled *Educação Financeira: cenários para investigação* (Financial Education: scenarios for investigation) (Argena and Munhoz, 2021), is an educational product based on the dissertation *Financial Education: a Critical Mathematics Education approach* (Argena, 2021).

The methodology used in this paper had a qualitative approach, employing specific criteria and characteristic reflection in order to analyze the data from the point of view of the researcher as well as the participating teachers. According to Stake (2011), a qualitative study is interpretative, experiential, situational and personalistic. Data was collected using a questionnaire, which asked questions with open and closed answers.

Content analysis, described by Gomes (2016) as a hybrid technique of qualitative and quantitative perspectives in the description, systematization and quantification of the data obtained in the interviews and questionnaires, was used to analyze and discuss the open-ended questions.

The paper is structured as follows: some assumptions are presented on the subject of Financial Education and Critical Mathematics Education, which is the theoretical basis for the development and analysis of the activities and learning environments that were evaluated. This is followed by a profile of the participants, analysis and discussion of the data collected, and the final considerations.

2 Theoretical framework

Financial Education is an educational process with a series of guidelines and concepts about the world of finance, budget planning and financial management:

> Financial education can be defined as "the process by which financial consumers/investors improve their understanding of financial products, concepts and risks and, through objective information, instruction and/or advice, develop the skills and confidence to become more aware of financial risks and opportunities, to make informed choices, to know where to seek help, and to take other effective steps to improve their financial well-being". Financial education, therefore, goes beyond providing information and advice Financial education, therefore, goes beyond providing information and financial advice (OECD, 2005, p. 5).

In addition, if the relationship with money is not established in a healthy way, it can cause serious damage to the citizen, such as indebtedness and consumerism, causing health problems, stress and compromised quality of life. Lima and Costa (2015) point out that

> Lacking the ability to manage their income and expenditure satisfactorily, individuals are seduced by quick and easy credit which, without efficient planning, can lead to debt and default. This leads to personal financial problems with emotional and psychological repercussions, as well as interference in the social and economic spheres, which can lead to family instability, a reduction in credit and a downturn in the economy (p. 34).

Reflecting on the importance of this topic for the lives of individuals in general, activities involving Financial Education were developed from the perspective of Critical

Mathematics Education and its assumptions. The activities were designed as learning environments with the potential to become scenarios for investigation.

Educação Matemática Crítica (Critical Mathematics Education — EMC) is a trend that has many epistemological assumptions and different characteristics, seeking the emancipation of the subject through the development of autonomy and critical awareness of the student. Based on democratic concepts, EMC encourages effective student participation, dialog and diversified methodologies that go beyond the exercise paradigm in the approach to mathematics (Da Silva and Nicolli, 2011). Thus, EMC seeks to present mathematics in a problematized way, linked to the social context and the influences that mathematical knowledge can have on society, especially in highly technological environments (Skovsmose, 2007).

Critical Mathematics Education is concerned with how mathematics in general influences our cultural, technological and political environment, as well as the purposes for which mathematical competence should serve. For this reason, it not only aims to identify how students most effectively learn and understand concepts such as fractions, functions and exponential growth. Critical Mathematics Education is also concerned with questions such as "how learning can support the development of citizenship" and "how the individual can be empowered through mathematics" (Alrø and Skovsmose, 2010, p. 18-19).

Through EMC, we can introduce students to mathematical concepts based on themes that are relevant to their social context, as is the case with Financial Education. In this way, teachers need to be aware of their role as educators, as well as the influences they have on students' learning and all-round development.

From this perspective, some of the concepts needed to apply EMC are listed, which will help the teacher to make learning and relationships with students more effective. In the development of EMC, dialog is a crucial point that needs to be observed by the teacher. According to Freire (1987, p. 47), "without it, there is no communication and without this there is no true education". Dialogue can therefore be seen as a process of discovery and mutual learning.

With a relationship based on constant dialog between all those involved, there is the possibility of developing student autonomy, making them capable of making their own choices and actively participating in the construction of their own knowledge. In relation to the proposed topic, Financial Education, there is a clear need to offer students the opportunity to develop their autonomy in a concrete and assertive way, so that they can make balanced and appropriate decisions at each stage of their lives involving monetary resources.

However, it is clear that the development of autonomy is a process that is built on experiences, interactions and challenges, which do not occur without the involvement of the various actors that influence the life of each child and/or adolescent. According to Freire (1996),

> autonomy is built up through the experience of many, many decisions being made. Why not, for example, challenge your child, while they are still a child, to take part in choosing the best time to do their homework? Why is the best time for this task always the parents'? Why miss the opportunity to stress to your children the duty and right they have, as people, to forge their own autonomy? No one is the subject of anyone else's autonomy. On the other hand, nobody matures suddenly, at 25. We mature every day, or not. Autonomy, as the maturing of being for oneself, is a process, it's becoming. It doesn't happen on a set date (p. 41).

With the development of autonomy and the participation of everyone through dialog,

we can observe situations in which democracy is effective, enabling everyone to present their opinions and define, as a group, the decisions that will influence everyone. The classroom is a favorable environment for exercising democracy, as it allows for the socialization of relevant information and discussion mediated by the teacher. It is therefore necessary to develop learning environments that move from the paradigm of exercise to scenarios for investigation at different times.

According to Skovsmose (2000), a scenario for investigation is an environment that can support investigative work by inviting students to formulate questions and seek explanations. Questions can be formulated with references to pure mathematics, semi-reality or reality (Table 1). These are open questions that allow for different answers, encouraging students to continue their research in order to deepen their knowledge and develop their creativity. In this way, students will have the opportunity to experience different methodologies, assessments and content exposition with their effective participation, going beyond the mere use of ready-made exercises that do not allow for discussion, expansion and reflection on the proposed theme.

Table 1: References that present the context of the scenario

Reference	Definition
Pure Mathematics	These are environments in which the proposed content refers to the application of Pure Mathematics, for example, the presentation of the formula for calculating simple interest.
Semi-reality	These are environments in which examples are used with references to everyday situations. However, this situation is presented based on certain characteristics that have been defined by the author of the question, for example: organizing the income and expenditure of a fictitious family in a table.
Reality	These are environments in which real situations are addressed, for example: data taken from published research or real newspaper reports.

Source: Adapted from Skovsmose (2000)

Based on the theoretical assumptions presented, the data obtained from the evaluation carried out by a group of teachers will be discussed and analyzed. Next, the methodological procedures used to collect and analyze the data will be described.

3 Methodological procedures

Based on the theoretical framework covered, different scenarios were developed on the subject of the *Family Budget*, with a focus on Financial Education, proposing different activities. Next, we will present some analysis of the results found in an evaluation carried out by a group of teachers, based on the discussions and analysis of the scenarios and activities, as well as the completion of a questionnaire to collect data. Based on these results, we analyzed how the activities reflect the main characteristics of EMC, checking whether there are signs that demonstrate the possibility of developing autonomy and democracy, with the effective participation of all, through dialogue.

To evaluate the proposed scenarios and activities, we invited some teachers who, at the

time, were master's students in the Postgraduate Program in Science, Mathematics and Technology Teaching at the State University of Santa Catarina (UDESC) — Joinville. The group was chosen because of their familiarity and knowledge of the theoretical framework used. Initially, 23 teachers were invited, six of whom agreed to take part.

Of these teachers, four took part in a remotely recorded meeting via the *Google Meet* platform to analyze and discuss the proposed scenarios, and then answered a questionnaire. The other two made their contributions remotely and asynchronously, without the participation of the researcher, analyzing the material containing the scenarios and then answering the corresponding questionnaire. Both the material containing the scenarios and activities and the questionnaire for the two groups of participants were made available before the meeting on the *Google Drive* platform.

Therefore, the assessment was carried out in two separate moments. The *first assessment* took place synchronously, during the virtual meeting, so that all the material made available was discussed. At this point, the participants gave their opinions on the textual part of the scenarios in terms of clarity, proposal, interpretation, appropriateness of the vocabulary used, as well as criticisms and suggestions. The *second assessment* was carried out asynchronously by filling in the questionnaire on the material provided.

The profile of the participants was predominantly female, aged between 23 and 52. Their academic backgrounds include: a degree in Mathematics (three participants); a degree in Languages (one participant); Pedagogy (one participant) and a Specialist in Professional Education (one participant), with only one of the respondents having no specialization.

The participants have varied teaching experience. With regard to the length of time they have been trained and working as teachers, it can be seen that half of the participants (50% — 3) have more than 15 years of training and experience; 33% of the participants (2) have been trained and have between 1 and 5 years of teaching experience; and only 1 participant (16%) has between 6 and 10 years of training and experience.

It is very important for the material to be evaluated by colleagues from different areas of knowledge, with different lengths of teaching experience, as it allows for a rich discussion from different perspectives. In this way, the proposed material was analyzed not only by experienced people who know the subject in question, in this case Mathematics, broadening the perception of the work, the understanding of the text and the proposed activities. The analysis and discussion of the results obtained from the evaluation of the material will be presented below.

4 Analysis and discussion of results

The questionnaire included questions with open and closed answers. For the questions with open answers, the content analysis technique was used, described by Gomes (2016) as a hybrid approach that integrates qualitative and quantitative perspectives in the description, systematization and quantification of the data obtained through interviews and questionnaires. Content analysis was carried out using the following steps: categorization, description, inference and interpretation of the data collected from the questionnaire, with the aim of assigning meanings to the answers, based on the theoretical framework presented.

To this end, five categories were created, presented below, with their respective subcategories:

1) Relationship between the activities described and the theoretical framework: This

category has two subcategories: aesthetics and activities that demonstrate the use of EMC;

2) Do you work and/or have you worked on Financial Education? In what way? This category has a subcategory: experience and familiarity.
3) Knowledge of EMC and other trends in Mathematics Education.
4) Possibility of teaching mathematics based on EMC concepts: This category has three subcategories: scenario, content and applicability by the participants.
5) Opinions and suggestions about EMC.

Category 1 refers to the results found during the recorded meeting and the answers obtained in the questionnaire, related to the activities and scenarios proposed in the pedagogical notebook, in the light of the framework used. Due to the different responses, subcategories were listed to better organize the data.

At the first moment of the evaluation, which was carried out synchronously, considerations were presented about the suggested scenarios and how the *relationship between the activities described and the theoretical framework* used was perceived. According to teacher P3, *the activities clearly show the author's appropriation of the theoretical framework, Critical Mathematics Education, a complex framework with many theoretical assumptions.* Also in relation to the proposed scenarios, teacher P4 said that *it was interesting to realize that the activities were linked to the student's daily life, demonstrating their applicability in the classroom.*

Most of the scenarios were constructed on the basis of reality (see Table 1). These learning environments offer "a different condition for communication between the teacher and the students, since it now makes sense to question and supplement the information provided by the exercise" (Skovsmose, 2000, p. 76). In this way, they favor applicability in the classroom and dialogue between teacher and students, since they are based on real life.

To the question: *Does the activity presented demonstrate the use of the EMC trend? Explain your answer*, only one of the participants was unable to verify the use of EMC in the development of the activities evaluated, justifying that it is not his area of training. The other participants said that yes, the activity demonstrates the use of this trend, and listed the following characteristics to justify their answers: the presentation of everyday themes in real situations in which mathematics is used; the opportunity to promote dialogue throughout the proposed scenarios, with reflections on Financial Education, which enables the development of autonomy; and the fact that the activities do not prioritize technical rationality, i.e. the exercise paradigm is not present.

According to Skovsmose (2000), in the exercise paradigm, lessons are usually divided into two moments: in the first, the teacher explains the concepts and cites examples and, in the next moment, the students solve exercises, usually taken from textbooks. "The central premise of the exercise paradigm is that there is one, and only one, correct answer" (Skovsmose, 2000, p. 67), which does not allow for questioning or reflection on the proposed topic.

When developing activities based on EMC, it is necessary to pay attention to the assumptions of the theory and provide students with learning environments that foster learning, curiosity and autonomy, which are important elements in the construction of knowledge.

Other questions arose during the evaluation, with the aim of improving the understanding of the activities for those accessing the material and making them more practical

to develop in the classroom. The *aesthetic issue* is an important point that was highlighted as unfavorable, which reveals the need to work more in-depth on artistic issues in the development of the material.

In Category 2, *Do you work and/or have you worked with Financial Education? In what way?*, questions were asked about the participants' *experience and familiarity* with the development and application of activities involving Financial Education.

For the question *Do you work with Financial Education? In what way? (Financial Mathematics is different from Financial Education, the latter being more comprehensive)*, half of the participants (three) said they didn't work with this subject in the classroom. One of them said that they do discuss Financial Mathematics with their students, which has different concepts and approaches to Financial Education. This demonstrates the importance of developing support materials on the subject, which can help disseminate the topic. In this way, the teacher could "contribute to triggering reflections and, why not, actions, in a sense more focused on people's consumer decision-making, contributing to the formation of financially and critically educated citizens" (Campos and Kistemann Jr, 2013, p. 50).

The participants (three) who have already addressed Financial Education in their classes express their treatment based on everyday situations, with the aim of making students aware of the relevance of the topic. According to Lima and Costa (2015),

> an investigative connection with reality presupposes connecting to reality with the aim of investigating, analyzing situations and looking for ways to find possible solutions. This process, which enables students to come into contact with situations that have meaning in their daily lives, involves a collective space for reflection and understanding of concepts, information and experiences in their social group (p. 35).

It can therefore be said that Financial Education is considered relevant to education professionals, which reinforces the merit of the proposed scenarios.

Category 3 refers to the participants' knowledge of Critical Mathematics Education, as well as their knowledge of the different trends in Mathematics Education, which help teachers develop curricula, methodologies and classroom practices.

The participants were asked about *their knowledge of the different trends in Mathematics Education*, since one of them was being addressed. Only two participants said they did not know the current trends, the most cited being: Ethnomathematics; Problem Solving; Critical Mathematics Education; Technologies; History of Mathematics; Mathematical Modeling; Mathematical Investigation and Interdisciplinarity.

They were then asked about their specific knowledge of the Critical Mathematics Education trend, which was used in the development of the proposed activities and scenarios. Only one participant claimed to be unaware of this line of thought. However, it should be remembered that two of the participants do not have specific training in mathematics.

To the question *Have you ever worked in the classroom with the EMC trend? If so, what was it like? If not, why?* Considering the theoretical assumptions of Critical Mathematics Education, it is understandable that three of the participants said they had not used this trend in their practices. This is due to a lack of knowledge about the approach or a lack of awareness of its potential for developing different skills in students.

According to Silva and Nicolli (2011),

> we envision critical mathematics education as a means of making it possible to realize that the ideas, the concepts, the structuring of the curricula and the parameters are designed to serve certain interests. Interests of the students, the teachers or who? That's why it's interesting, when thinking about teaching mathematics, to ask: what to teach, why to teach it, who to teach it to and how to teach it. These and other questions can permeate the practices of teachers who teach mathematics with a view to making the lesson have a raison d'être (p. 71).

Therefore, it is clear that the dissemination of this line of thought and its potential is necessary, as well as the proposal of activities based on it, in order to arouse interest on the part of teachers and its application with students.

On the other hand, the participants who said they had already worked with EMC in the classroom highlighted its positive points, such as the effective participation of the students, showing interest and creativity; the association of the trend with various contents, such as Geometry; and even the approval of parents and school managers when they saw the results obtained with the development of these differentiated activities.

> Transformations in the way we think and live together, when addressed in the space of the school and the schooling process, indicate the need to discuss the management of the space and the pedagogical practices that are established in it. In the school environment, these issues have been contributing to ruptures in the models of representation of reality, requiring each of us, teachers, to indispensably problematize the school institution and pedagogical practice, and to mobilize pedagogical knowledge capable of meeting the socio-educational demands brought about by the profound transformations that contemporary societies are undergoing (Paiva and Sá, 2011, p. 6).

It can thus be seen that theoretical knowledge of EMC and its application can provide diversified learning environments in which effective learning takes place for all those involved in this context.

Category 4 refers to the possibility of teaching mathematics based on EMC concepts, using the proposed scenarios. The activities were also evaluated according to the content and language used in their development.

To the question *Do you believe it is possible to teach mathematics based on EMC concepts, based on constant dialog with students, developing democracy and helping students to develop their autonomy? How?*, all the participants answered in the affirmative. They highlighted the use of everyday situations, getting closer to the students' reality, with diversified methodologies, such as investigative activities that promote reflection and discussion of mathematics and its social role.

According to Skovsmose (2007, p. 227),

> reflections are about something real and public. They are not just focusing on small but different personal experiences. When reflections are directed at actions, they are covering more than personal experiences. They are about real events, and in many cases these events affect many people. In particular, reflection can deal with mathematics in action and what can be done through mathematics. Through these observations I point to an interpretation of reflection that resonates with the realism of mathematics in action. [...] And whatever conclusion can be reached, decisions have to be made. Mathematics is put into action. Mathematics becomes realized and reflections can be directed towards what is realized.

Although everyone agrees that it is possible, it was also pointed out that this practice is not feasible to apply in all classes, as it is exhausting and demands a lot from both the teacher and the students. It is therefore necessary to mix the methodology with different approaches. Skovsmose (2000) points out:

> I maintain that math education should move between the different environments as presented in the matrix. In particular, I don't consider the idea of completely abandoning math education exercises. [...]. It is important that students and teachers together find their way between the different learning environments. The "optimum" route cannot be determined in haste, but has to be decided by the students and the teacher (p. 81).

The proposed scenarios are learning environments that can favor the development of autonomy, as well as dialogue and democracy. Skovsmose (2000, p. 72) states that "a scenario for investigation is one that invites students to ask questions and seek explanations", which can favor the development of the skills listed. Therefore, the question *Do the proposed scenarios provide learning environments that enable autonomy, dialog and democracy? In what way?* becomes pertinent and necessary in the process of evaluating the activities.

According to one of the participants, this objective will only be achieved if the didactics of the teacher applying the proposed activities are adequate. For the others, the scenarios in themselves already offer these possibilities, as they encourage student participation through research, problematization of concepts, decision-making by the student and the class as a whole, as well as the construction of knowledge with everyone's opinion. This emphasizes dialogue and discussions that generate reflection and respect for others, building a democratic environment in which everyone is an active participant. According to Skovsmose (2000, p. 72), "when students take over the process of exploration and explanation, the research scenario becomes a new learning environment. In the inquiry setting, the students are responsible for the process."

In addition to the *content, scenarios and approach* taken in the proposed activities, the participants were asked about the language used and whether it had any specific characteristics. The results show that the language used in the activities was accessible, coherent and understandable. It can also be said that at no point did the language appear inappropriate.

In this context, the participants were asked whether they would apply the proposed scenarios and were asked to justify their answers. At the end, they were able to express their opinions and suggestions about the activities evaluated, referring to Category 5.

When asked: *Would you apply the proposed activities? Justify*, all the participants said yes, because the activities, according to them, are attractive and make sense as they relate mathematics to everyday problems. In addition, the scenarios are well designed and easy to understand and apply.

According to Skovsmose (2000),

> any research scenario poses challenges for the teacher. The solution is not to return to the comfort zone of the exercise paradigm, but to be able to act in the new environment. The task is to make it possible for the students and the teacher to be able to intervene cooperatively within the risk zone, making this a productive activity and not an experienced or threatening one. [...] an important condition for teachers to feel able to work in the risk zone is the establishment of new forms of collaborative work, particularly between teachers, but also together with pupils, parents, teachers and

researchers (p. 85).

To the question "*Do you have any suggestions, criticisms or comments about the activity presented?*", many compliments and some suggestions were recorded and analyzed to check the possibility of developing the activities, such as the presentation of objectives, assessment strategies and the relationship between the mathematical content that can be covered in each scenario. According to teacher P1, examples related to the students' lives are needed". In terms of praise, teacher P5 said: *Congratulations, your activity is clear and accessible to teachers who wish to use it, and it goes further, as it shows in a simple way how to insert critical mathematics into our classes.*

The answers found made it possible to reflect on the development of the proposed activities and scenarios, providing a broader vision. When designing the educational product, the comments on aesthetics were taken into account, with the aim of presenting the book in an attractive and distinctive way. To this end, a design application was used, which is also suggested for use with students, with all the design produced by the author. As for the scenarios and activities, the three references presented in the Critical Mathematics Education trend were used - Pure Mathematics, Semi-reality and Reality. Finally, different suggestions were made that can help teachers develop a variety of scenarios and activities in the classroom.

5 Main results

The evaluation made it possible to view the proposed material from a critical viewpoint, so that its results helped to improve the pedagogical notebook developed. It showed that material with activities and scenarios on the subject of Financial Education is of the utmost importance and social relevance (OECD, 2005).

Although the participants showed some knowledge of the subject, it was clear that there was a need to explore the difference between Financial Education and Financial Mathematics so that their approach is not limited to the exercise paradigm (Skovsmose, 2000). Financial Education encompasses more aspects and concepts which, if not taught effectively and meaningfully at school, can lead to major problems in the future (OECD, 2005; Lima and Costa, 2015).

Activities based on EMC, such as the activities evaluated, not only relate mathematics to everyday situations, but also give students the opportunity to develop their autonomy by allowing them to question the proposals, reflect on the topic and present their considerations in different scenarios (Freire, 1996; Skovsmose, 2000).

When analyzing the activities and scenarios developed, the possibility of analyzing mathematical concepts through new eyes with the use of EMC stands out, demonstrating how favorable this trend can be for learning (Silva and Nicolli, 2011; Paiva and Sá, 2011).

Although it is a great challenge to develop materials based on Critical Mathematics Education, it was clear that it is a real possibility. In addition, EMC is concerned not only with technical issues in mathematics, but also with social issues, such as financial education, promoting learning that broadens mathematical knowledge and its relationship with society (Alrø and Skovsmose, 2010; Skovsmose, 2007).

The production of materials that present open-ended situations and allow students to question favours learning, as they are characterized as learning environments with the potential to become scenarios for investigation (Skovsmose, 2000). It was clear that there is a need to produce more materials of this nature, which present diversified methodologies and approaches

to Financial Education in the school environment, reiterating the discussions presented by the EMC (Alrø and Skovsmose, 2010; Skovsmose, 2000, 2001, 2007), as well as expanding the knowledge of Financial Education evidenced by different references (OECD, 2005; Lima and Costa, 2015; Campos and Kistemann Jr, 2013).

The construction of the material presented and evaluated represented a challenge in many ways, mainly due to the complexity of EMC. However, teachers must not shy away from the opportunity to get out of their comfort zone and look for new ways to make learning more effective for their students (Skovsmose, 2000).

6 Final considerations

Financial Education is a set of concepts and procedures that are relevant to our society and should be presented in schools in a broad and effective way. For this to happen, curricula have increasingly included Financial Education as a topic to be addressed at different levels of education. In order to explore this theme, a pedagogical notebook was produced with activities and learning environments on Financial Education, based on the trend of Critical Mathematics Education (EMC).

Critical Mathematics Education proposes the teaching of mathematics combined with concepts from the students' daily lives, aiming for everyone's participation through dialog, thus building a democratic environment that enables the development of autonomy. To this end, the teacher needs to provide a learning environment capable of evolving into a scenario for investigation, in which the construction of knowledge is collective and accepted by all members. In line with the learning environment, the teacher needs to work with teaching materials that support the scenario for investigation.

Once the EMC-based scenarios and activities had been developed, an evaluation was carried out remotely, in two stages: one synchronous, for discussion and analysis of the scenarios and activities, and the other asynchronous, with the completion of a questionnaire to check the presence of the main points of the theory, analysis of the questions, understanding of the text, etc. The evaluation was carried out with 6 teachers who had completed the master's degree in Science, Mathematics and Technology Teaching at UDESC.

Throughout the evaluation, it was recognized that the proposed scenarios are learning environments with the potential to become scenarios for research into Financial Education, as they present themes and situations related to students' daily lives, which encourage dialogue, interaction between teachers and students, and the participation of all, favouring the development of autonomy.

Finally, the importance of developing materials for teachers that enable them to change their teaching practices was highlighted. The aim is to encourage students' learning, interaction, creativity, criticality and autonomy, based on dialogue and democracy, thus making Financial Education learning a reality.

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