

# RELATING PROBLEM SOLVING TO FINANCIAL EDUCATION

## RESOLUÇÃO DE PROBLEMAS NA EDUCAÇÃO FINANCEIRA

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### ABSTRACT

In a research project, developed during a master's degree research in basic education teaching at Escola Superior de Educação of the Polytechnic Institute of Porto, a question relating the problem solving in children's daily life to the development of financial education in basic education students raised. A suitable methodology was applied to the study, and 5th grade students were challenged to construct mathematical knowledge on the multiplication of non-negative rational numbers, through problem solving, and to activate concepts related to financial education. In this sense, a learning process was carried out, in which the problems created, the differentiated didactic-pedagogical materials used (such as origami, board games, interactive games) and videos were fundamental not only for promoting children's involvement in this project but also to stimulate the learning and the development of an interest for mathematics. Thus, this publication aims to share some of the results achieved and to reflect on the virtues and potentialities of research-action methodology project for the consolidation and strengthening of mathematical and financial contents in a perspective of education for citizenship.

Key words: Mathematics in context, Problem solving, Financial Education, Education for citizenship.

### RESUMO

Num projeto de investigação desenvolvido no âmbito do Mestrado em Ensino do 1.º e do 2.º Ciclo do Ensino Básico da Escola Superior de Educação do Politécnico do Porto foi colocada uma questão-problema que relacionava a resolução de problemas do quotidiano das crianças com o desenvolvimento da Educação Financeira em estudantes do 2.º ciclo do Ensino Básico. Traçou-se uma metodologia adequada ao estudo, tendo sido desafiados os estudantes do 5.º ano a construir, através da resolução de problemas,

conhecimentos matemáticos sobre a multiplicação de números racionais não negativos e a mobilizar conceitos relacionados com a Educação Financeira. Neste sentido, foi realizado um percurso de aprendizagem em que os problemas criados, os materiais didático-pedagógicos diferenciados utilizados, como os origamis, o jogo de tabuleiro, o jogo interativo e os vídeos foram fundamentais não só para o envolvimento das crianças neste projeto, como também para os estimular para a aprendizagem e para o desenvolvimento do gosto pela Matemática. Assim, esta publicação pretende partilhar alguns dos resultados obtidos e refletir sobre as potencialidades do projeto de metodologia investigação-ação para a consolidação de conteúdos matemáticos e financeiros numa perspetiva de educação para a cidadania.

Palavras-chave: Matemática em contexto, Resolução de problemas, Educação Financeira, Educação para a Cidadania.

## 1. Introduction

In this work, it was fundamental to create opportunities for students to construct their mathematical knowledge through a "healthy relationship with money". Therefore, the course of action was based upon significant mathematical challenges, appropriate and contextualized (Pereira, Feitosa, Silvério, & Sousa, 2009), that directly explored subjects within the scope of financial education. In fact, school is enclosed in a consumer society in which "having" is far more valuable than "being". It is imperative, then, to develop mathematical knowledge in a perspective of education for citizenship. Accordingly, an attempt was made to address both the need for financial education in schools and learning difficulties faced by children as it is mentioned in the educational project of a school cluster in Porto district, considered a priority intervention educational territory. Thus, a problem question inevitably arose: "How does 'problem-solving approach to daily life' in mathematics teaching contribute to the development of financial education in basic education students?"

The methodology of investigation was outlined, beginning by establishing the theoretical framework on financial education, solving some mathematical problems, and defining the conditions of intervention and the detailed description of the sessions. Afterwards, data analysis was presented as well as the discussion of the results obtained. Finally, last considerations were presented, seeking to answer to the problem-question addressed and mentioned above.

## 2. Problems and aims

The motivation for choosing this theme is that financial education has recently been integrated as a guideline for teaching education for citizenship. This new educational objective aims the students' personal and social formation and it is therefore an innovative and challenging subject, both from the perspective of researcher and teacher. Therefore, the need to carry out this project in a context of a school with a priority intervention or hereinafter referred to as "TEIP school", mainly because of the social problems school's population face. The subject is also extremely relevant for this type of environment, for the students' recognition and understanding of the need to learn, in the field of learning mathematics, how to manage money in the present and future or, as it is referred to by the National Council of Teachers of Mathematics (NCTM) "the need

to understand mathematics and to be able to use mathematics in everyday life, and in the workplace, has never been so pressing" (2008, p. 4). In this particular sense, Caraça (2000) reinforces this idea by stating that, despite contemplating problems of its own, mathematics is also related to real life. Once again, defending the idea of functional teaching with a strong connection and applicability to everyday life. In this perspective, mathematics classes can provide opportunities for financial formation and learning. It is, consequently, important to sensitize students to the importance of financial literacy by making them construct basic financial concepts to enable deeper knowledge and understanding of financial information, and, subsequently, a better choice of financial products.

In terms of work, it was then fundamental to contextualize the tasks with everyday situations or situations closer to the reality. This process involved both the financial management and the construction and development of financial knowledge, including, nevertheless, mathematical knowledge. In fact, the understanding of mathematics is essential, as it is considered a facilitating means of learning, of autonomy and the ability to face new situations and problems (NTCM, 2008).

In this research context, students' real needs and the democratization of mathematical science guide us in defining the following objectives: i) to develop an intervention project that relates the field of financial education to mathematics learning and ii) to understand the importance of financial education, when addressed in a formal context (mathematics classes). In what concerns the conceptual and didactic component of mathematics, the following objectives were designed: i) to construct mathematical knowledge related to the multiplication of non-negative rational numbers through the resolution of problems close to the daily life of the child and related to saving and money management and ii) to improve knowledge about financial education in a didactic and articulated way with mathematics.

In summary, throughout this research, this research tried to understand whether it is possible to relate financial education to mathematics domain in such a way that students improve their general knowledge. This will certainly provide students with tools that will enable them to develop behaviours and rational attitudes towards issues of economic, financial and mathematical nature, taking into account the educational context.

### **3. Literature review**

#### **3.1. Financial education: a social value**

Financial education is a subject area normally approached by the education for citizenship. According to the OECD (2006) and cited by Dias et al. (2013), it is the process by which financial consumers improve their understanding of financial products and concepts and develop the abilities and confidence to become more aware of financial risks and opportunities. In a more simplistic perspective, according to Gitman (2004, apud Pereira, Feitosa, Silvério, & Sousa, 2009), financial education is "the art and science of money management" (p.4) and can benefit all citizens regardless of their income level (Tavares, 2012).

Aware of the need to "financially educate" children so they can make informed decisions and build and develop behaviours that improve their financial well-being, the National Council of Financial Supervisors proposes the exploration of concepts related to financial education from early children's schooling. For this purpose, this project focused on the development of financial education, that is, "the ability to make informed judgments and make effective decisions for the management of money" (National Council of Financial Supervisors, 2011, p.5 ). In addition to money management implicit in solving problems, children should have the opportunity to explore monetary, economic and financial issues relevant to this domain (Orton, 2007, cited by Dias, et al., 2013). Sometimes the lack of knowledge might lead to indebtedness and over-indebtedness of families. As numerous cases of indebtedness have been esteemed in Portugal, the National Confederation of Family Associations (CNAF) and the Centre for Support to the Indebted (CAE) created the organization "SOS Indebted Families". In fact, according to the main Portuguese Association for Consumer Protection, hereinafter referred to as "DECO", in 2016, nearly 30,000 over-indebted households requested help from the DECO Over-indebtedness Support Office, more 474 families than in 2015. However, only about 3,000 of them restructured debts (Cruz, 2017). This evidence may be a clear indicator that the improving knowledge in the field of financial education is fundamental so these problems can be tackled to give a fast and effective answer.

### 3.2. Problem solving: knowledge dynamics

In fact, it is with "reading" the reality (Santos, 2012) and through the situations and problems to be solved that a concept [being mathematical or financial] becomes meaningful for a child (Claudino, Nunes, & Silva, 2003). In the problem-solving perspective, which is an integral part of all mathematical learning (NCTM, 2008), it is still essential that children relate knowledge and concepts already built, the rules, techniques and intellectual skills to find an adequate and meaningful response in problem solving (Fernandes, 1994).

Smole (2013) and Palhares (2004) point out that problem solving related to real life fosters an interest in this task, develops mathematical language, promotes children's autonomy and creates the ability to face new problems without fear. De Lange (1992, quoted by Cheng, 2013) argued that mathematics should never be presented to students as a ready-made product as it should be viewed as an activity of the human being. Instead, students ought to invent and reinvent maths through situations that make sense in their real lives.

Still regarding realistic mathematics, or to be more precise, focusing on context problems in the form of games, stories and tables, it is possible for students to assign meanings and use their knowledge and personal experience (Pinto, 2004). Considering the model adapted from Fernandes, Vale, Silva, Fonseca and Pimentel (1998, apud Vale & Pimentel, 2004), four major moments should be considered when solving problems: reading and understanding the problem, accomplishment of a plan, confirmation of response and evaluation. These problems should be challenging, appropriate, and should promote a connection with students' prior knowledge (Smole, 2013) so children might be able to boost new knowledge from a constructivist perspective, and be able to solve problems in other contexts, 2013), promoting, whenever possible, the teamwork (student-student).

For this reason, it is crucial to foster children's interest in solving problems, as they will be able to build autonomy and the ability to face new problems without fear and distress (Palhares, 2004).

Pinto (2011) analyses aspects of teaching and learning of rational numbers and states that steadily building up students' knowledge about this content is very challenging, because students often have difficulties in understanding it. Actually, the author proposes a knowledge dynamics in exploring the meaning of rational numbers as it is presented in the following:

Table 1 – Rational number sense (Pinto, 2011, pp.112-113)

Rational number sense	
Components	Abilities to be developed
Familiarity with the different meanings of fractions in context	Recognising the different meanings of fractions (dividing in equal parts, part-whole, operator, rates and ratios) in both discrete and continuous situations
Flexibility with the referential unit of fractions in context	Reconstructing the referential unit (in a discrete or continuous situation) Identifying the referential unit (in a discrete or continuous situation)
Familiarity with different representations of the rational number	Connecting different representations (decimal numeral, fraction and mixed numeral) Recognising equivalent fractions
Flexibility in comparison, ordination and density of rational numbers	Representing rational numbers in a number line Comparing and ordering rational numbers Recognising the existence of other numbers between two rational numbers
Symbols and formal mathematical language of rational numbers	Relating the symbols to actions and informal knowledge. Relating the symbols to formal mathematical language

However, in the project carried out, the most developed abilities regarding the meaning of rational number were: the recognition of the different meanings of the fractions; the connection of different representations; the comparison and ordering of rational numbers; the relation of symbols with actions, informal knowledge and formal mathematical language.

#### 4. Methodology

An investigation always involves a problem, so it is necessary at a preliminary stage to define a problematic question. This project with research-action characteristics (IA) was guided by the project methodology related to the on-site procedure. The aim was to confirm a tangible problem (Bell, 2002) and to outline strategies to solve it, being

aware, though, that the resolution will always be unfinished due to the cyclic nature of the AI. In this particular case, there was a need to educate children so they were able to manage money correctly in an economically fragile context. Vilar (1993) mentions that any project starts from the desire to solve a certain problem situation that is postulated by reality. It is therefore crucial that teacher training is aware of these fundamental principles, so commonly associated with innovation and improvement on teaching practices (Barros, 2012).

The AI promotes a highly critical attitude towards own thinking and action, searching for improvement in the quality of learning by the students and for the teaching methodology used by the teachers, with clear effects on the change of educational contexts (Barros, 2012). Nevertheless, in this perspective, the cyclical nature of AI implies that the researcher plans, acts, evaluates and reflects. If the problem in question has not been fully or undeniably solved, then planning should be diversified and the process should be repeated. This investigation has always tried to take this guidance into account and to call upon a continuous reflection as a full exercise of learning and reformulation of concepts and procedures.

As far as the participants of this project are concerned, it is relevant to clarify that they were 5<sup>th</sup> grade students and their parents/guardians of a *TEIP* school in Porto city, chosen through the random sampling method. As a result, 13 (thirteen) students were selected (through a natural selection based upon the highest number of sessions students attended) and, 12 (twelve) parents/guardians were chosen. It is important to mention that there was no specific method in the selection of the parents or guardians. Nonetheless, a questionnaire was the instrument used and only 12 parents/guardians responded. Hence, the scope of the research was widened so all the answers were thoroughly analysed as they could enrich the study.

The data collection instruments used were session audio recordings, observation grids and questionnaire surveys, which were applied to students at the beginning of the project and at the end of each session, as well as to parents/guardians. The observation grids used allowed the teacher, as a researcher, to raise awareness of learning processes that were built and developed by the students, both in the field of financial education and mathematics. On the other hand, the questionnaire survey allowed an adequate analysis of the information obtained about the conceptions of students and parents/guardians (Mozzato & Grzybovski, 2011). On October 31<sup>th</sup>, in order to promote awareness of the meaning of the World Savings Day, the teacher researcher implemented the first questionnaire (Figure 1). This questionnaire had, in its basic creation, a mathematical reflection because it sought to obtain the children's opinion on the relationship between mathematics and financial education and, at the same time, to approach concepts, such as Venn diagram, already explored in the early years of primary school.

**Does Mathematics help saving money?**

This survey belongs to a research project that aims to understand the importance of Mathematics in financial management.  
Your answers are important and confidential Please collaborate.  
 Read, observe, respond and deliver to your teacher. Thank you.

Mathematics

Mark with an X the answer that best fits your opinion.

Do you think that learning mathematics is important for your daily life?  
 yes  no  Why?

*As mathematics helps us count the money and do better calculations*

Spending money helps you to learn mathematics?  
 yes  no  why?

*To count money we need to know mathematics*

Learning mathematics helps you to save more money?  
 yes  no  why?

*Because to save we need to do calculations so we should know math*

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Financial Education

Select and choose which verbs you can connect with Math and with Financial Education.

- Learn how to save .
- Learn how to be wasteful.
- Learn to misuse money .
- Learn how to save properly

Read carefully the sentences above and complete the following:

To me, Financial Education is...

*Learn how to save properly*

Why?

*As it helps us to understand how we can save money, for example:*  
*-put money in the money box*  
*-spend money only when necessary*  
*-do not spend all the money at the same time*

Read carefully the sentences above and complete the following:

To me, Financial Education is...

*Learn how to save properly*

Why?

*As it helps us to understand how we can save money, for example:*  
*-put money in the money box*  
*-spend money only when necessary*  
*-do not spend all the money at the same time*

World Savings Day | October 31st




Figure 1: Questionnaire survey (answers written in Bradley Hand ITC)

### 5. Intervention Project: Multiplying, Saving, Managing, Reflecting to Win!

The intervention project called "Multiplying, Saving, Managing, Reflecting to Win!" was developed in 6 sessions (Table 2) in which real problems with financial meaning were explored (Santos, 2012). Three sessions were developed in mathematics classes, while the other three were carried out in citizenship classes. As mentioned in the financial training plan, financial education can be implemented in compulsory school subjects from the curricula. It is not therefore necessary to create an autonomous school subject, so the solution is to use differentiated and motivating resources to teach this topic.

Table 2: Approaches and objectives of the project sessions

Session	Approach	Objectives
1. <sup>a</sup>	Mathematic	To activate knowledge, understanding and skills to multiply fractional numbers by whole numbers.
2. <sup>a</sup>	Mathematic	To solve problems that requires multiplication with rational numbers represented by fractions, tithes and percentages.
3. <sup>a</sup>	Mathematic	To apply the previous explorations using games
4. <sup>a</sup>	Financial Education	To participate on a field trip to the “Papel Moeda” museum.
5. <sup>a</sup>	Financial Education	To help students create a video about financial education
6. <sup>a</sup>	Financial Education	To consolidate financial concepts using games

To begin with, the first session of this project focused on the introduction of a new content through a problem-solving process aimed at saving. The students were given a square with fractions and verbs that related the issues in question, according to their own conceptions. After doubling the square, the children played a game called "Quantos-queres". This way, children activated previous knowledge by calculating with fractional numbers. They also solved challenges (Figure 2) to reflect on saving strategies and to apply them to problem solving.

**Desafio 1** – Imagina que recebias de mesada 40 euros mas nesse mês não tinhas necessidade de comprar nada em especial. Se quisesses poupar e colocar parte desse dinheiro no teu porquinho mealheiro qual das seguintes frações escolherias para poupar? Porquê?

- € Colocavas no teu mealheiro  $\frac{1}{2}$  do dinheiro.
- € Colocavas no teu mealheiro  $\frac{1}{4}$  do dinheiro.
- € Colocavas no teu mealheiro  $\frac{1}{1}$  do teu dinheiro.

▪ Apresenta os teus raciocínios na resolução deste desafio.

$$\frac{1}{2} = 20€$$

$$\frac{1}{4} = 10€$$

$$\frac{1}{1} = 40€$$

*1 porque ficava com mais dinheiro para o futuro já que agora não tinha necessidade de comprar nada.*

Achaste importante resolver este desafio? Porquê?

*Sim, porque é importante saber-mos poupar.*

Figure 2: Challenge “It’s your turn to show us that you know how to save!”

At the end of the lesson, a rectangle was handed out, which had to be completed by students in order to systematise the constructed knowledge (this specific pedagogical material was adapted and used in the 3 initial sessions). Additionally, the questionnaire was also delivered.

The next session was aimed at solving problems involving the multiplication of non-negative rational numbers, extended to fractional transformations in decimal fractions, decimal numerals and percentages, taking into account the construction of a deep intuitive knowledge of fractional numbers in significant contexts both for the concept as for the applications, making connections with decimals, percentages and reasons (Pinto, 2004). The manipulative material (Figure 3) used adequately responded to the objectives in the construction of knowledge, since, according to Reys (1971, quoted by Matos & Serrazina, 1996, p.193), the materials that can be manipulated correspond to "objects or things that the student is able to feel, touch, manipulate and move" and that, through the physical involvement of students, the use of different senses lead to active and meaningful learning.



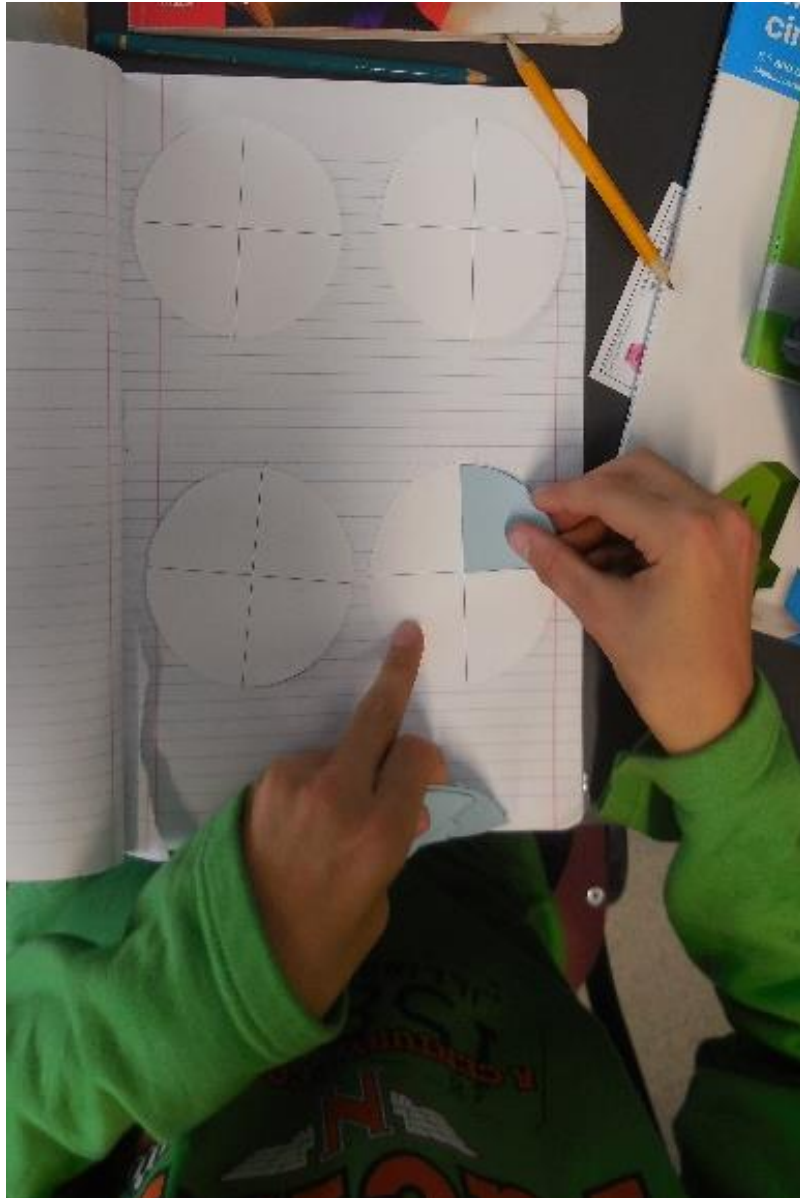


Figure 3: Children manipulating materials relating part-whole

In this perspective, and quoting Lima (2009, p.6), "the contextualised teaching materials ... facilitate the didactic and pedagogical procedures that will be developed with the students [but the teachers] need to build a suitable methodology that encourages the efficient use of these pedagogical resources".

In the second moment of the activation of students' previous knowledge, using Information and Communication Technologies (ICT), a new phase of motivation was developed when students watched a video the trainee teacher ([https://youtu.be/e2614y\\_g2y8](https://youtu.be/e2614y_g2y8)) prepared, focused on a problem connected with the children's daily lives. With this resource, students were challenged to think "about operations, their meanings and their forms of representation" (Smole, 2013, p.60) and, above all, they had the opportunity to "stop and think" (Fernandes, 1994). In this phase of the lesson students explored a new word - consumerism (rational, responsible,

balanced and informed consumption) - since math classes require the sharing of new vocabulary to increase students' lexicon and develop mathematical communication.

After reflecting on these two terms: consumerist and consumer, a worksheet (Figure 4) was presented with a set of challenges put into context with the previously mentioned video, in order to involve and challenge students to solve problematic situations and know how to save money.

Exploring the video – “Teresinha learns how to save money!”

Name: \_\_\_\_\_ Date: \_\_\_/\_\_\_/\_\_\_

*After seeing the video please answer these questions:*

**Challenge 1** – How much money did Teresinha received? *She received 60 euros.*

**Challenge 2** – Initially, Clara told Teresinha to spend only her money. How much could Teresinha spend?

- Introduce your reasoning in solving this challenge

$$\begin{array}{r} 60 \overline{) 240} \\ \underline{120} \phantom{0} \\ 120 \phantom{0} \\ \underline{120} \phantom{0} \\ 0 \phantom{0} \end{array}$$

$\begin{array}{r} 75 \\ \times 4 \\ \hline 300 \end{array}$

R: A Teresinha podia gastar €15.

*Answer: Teresinha could spend 15 euros*

**Challenge 3** – Teresinha considered that *one quarter* of the money she received was not very much. To teach her sister, Clara advised her to spend only 50% of what she received. How much money can Teresinha spend?

- Introduce your reasoning in solving this challenge.

$$\begin{array}{r} 60 \overline{) 30} \\ \underline{30} \\ 0 \end{array}$$

R: A Teresinha podera gastar €30.

*Answer: Teresinha can spend 30 euros*

Give your opinion about Teresinha's attitude throughout this story.

*Teresinha didn't know how to save money and she spend it in unnecessary things. When she received 60 euros on her birthday her sister decided to advise and persuade her to spend only a part saving the rest for Christmas time. Then Teresinha began to save.*

Figure 4: Work sheet “Teresinha learns how to save!” (answers written in Bradley Hand ITC)

At the moment of systematization, the personal strategies of some students were selected and shared (those that the teacher considered more appropriate) because a problem solver needs to be responsible for the solutions he discovers, but, for this, it is imperative that he has the right to present them, to discuss and to debate with his/her

colleagues. Having said this, it is essential for students to realize that there are several ways to solve a problem and, as Smole (2013, p. 59) says that students understand that they are capable of "doing math" that is, mathematics has many paths, but there is always an end. In this perspective, when contemplating and analysing different strategies (Mariz & Fernandes, 2010) and their representations, students expand their repertoire of processes to solve problems, perceiving the advantages and disadvantages of representations and creating autonomy in the search for solutions.

In the third session of the project, after reflection, it was decided to create and develop a board game (Figure 5) with mathematical challenges involving non-negative rational numbers and money management situations, supported by a game sheet where students had to record the strategies used and problem solving strategies.

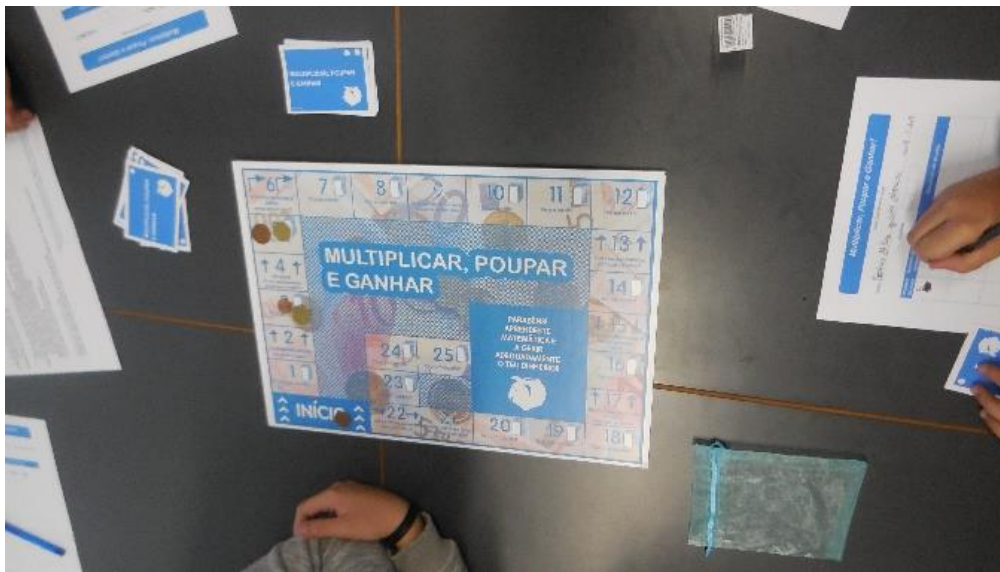


Figure 5: Children playing “Multiply, Saving and Winning!”

In this game, two different levels of difficulty were defined in order to promote pedagogical differentiation and to try to adjust teaching practices to the children as well as their personal and collective characteristics (Figure 6).

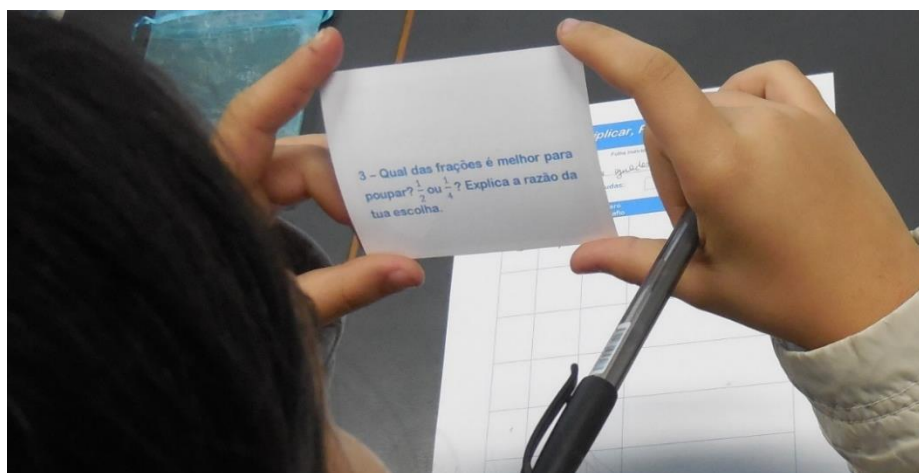


Figure 6: Children reading one of the challenges (It says: “Which of the fractions will you choose to save more?  $\frac{1}{2}$  or  $\frac{1}{4}$ ? Explain why”)

This last session was directed to the systematization of mathematical contents since, as defended by NCTM (2008), "as students acquire the conceptual bases of rational numbers, they must begin to solve problems, using strategies developed by them or adapted to their experience with whole numbers" (p.180), using didactic materials that, in Reys's (1971, quoted by Matos & Serrazina 1996) perspective, allow the student to "feel, touch, manipulate and move" (p.193) and properly contextualize, facilitate the didactic and pedagogical procedures (Lima, 2009). In addition, in this project, mathematical communication was considered fundamental. In this way, students were challenged to justify their choices based on Mathematics.

Concerning the 4th and 5th session of the implementation project, with the support of a Foundation, which is a reference in the field of financial education, the students went on a study trip and consequently recorded a video, where they were not only actors but also creators of a story about two families: a consumer and another consumerist, as previously mentioned.

In the last session, the students performed an interactive game (Figure 7) in which they had to manage the money available, according to the problematic situations that appeared in the game.



Figure 7: Interactive game called “How to manage the family income”

It is important to note that, at the end of each session, all students were given a knowledge consolidation form to fill out and paste on their notebooks. This way, they could, at home, activate the knowledge built in each of the sessions, thus developing their autonomy in their own learning process (Figure 8).

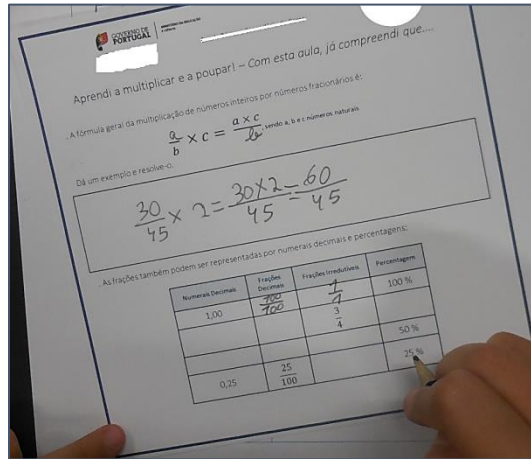


Figure 8: Student fulfilling the consolidation form

The aim was to meet students' needs, stimulations and motivation in order to contribute positively to their personal and social development, helping to build, in a transversal way, increasingly significant apprenticeships.

## 6. Results and discussion

Throughout the analysis process, the following category system was chosen.

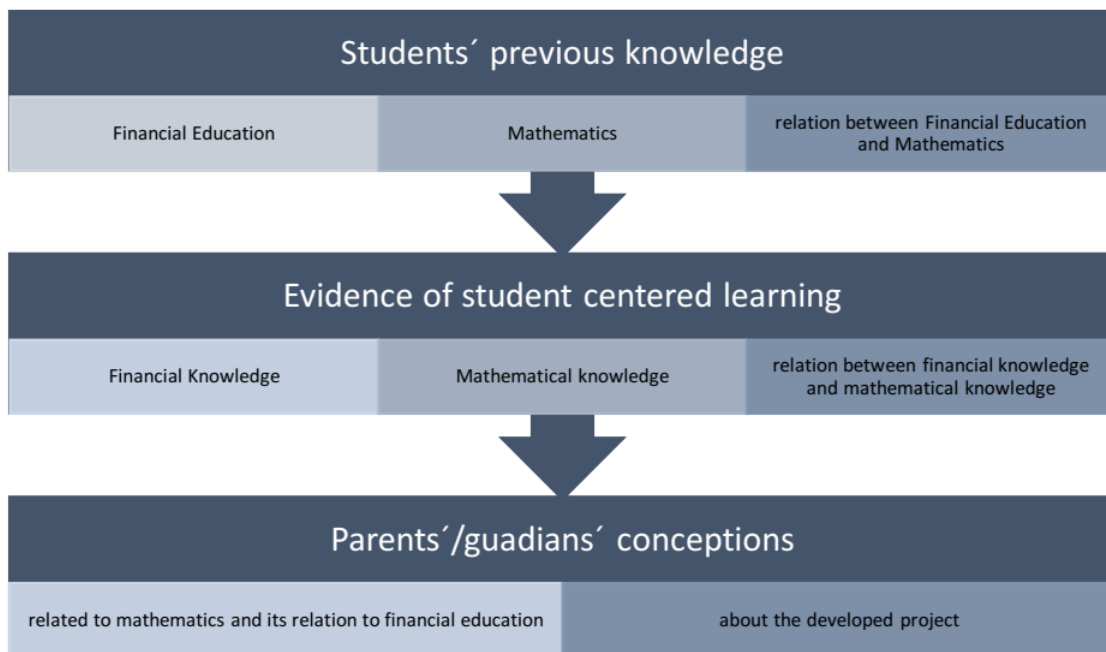


Figure 9: Category system applied

In the analysis of the first category - previous knowledge of the students - the main objective was to analyse the content of the previous concepts that the group of students - the sample - had about financial education, mathematics and the relationship between financial education and mathematics, to understand, through the conceptual cues of the statements, what the sample could identify in these three subcategories. Regarding financial education, there are indications that the majority of the sample (77%) believed that it promotes the understanding of adequate money management. The top three objectives chosen were the following: raising awareness about financial mismanagement, promoting about necessary and superfluous goods, and the development of skills in the field of saving money.

Regarding the second subcategory related to students' prior conceptions about mathematics, the resolution of the first problem that the children encountered was analysed. However, the conclusion was that only two children solved and interpreted the problem as it was presupposed, since they correctly completed the calculations and responded according to what was requested.

Regarding the third subcategory, there is evidence in the statements that point to the understanding of the relationship between mathematics and financial education since the children related some verbs (such as learning, saving, managing, educating) and 77% of the sample showed that use of money involves calculations.

In the second category, three subcategories were created: financial knowledge, mathematical knowledge and, finally, the relation between these two types of knowledge. In the 1<sup>st</sup> subcategory, the sample presents evidences of learning built in the field of financial literacy, and some students mentioned that: i) *I was aware that we should save money to have money in the future*; ii) *I started to manage my money better*; iii) *I learned more about saving and taught my whole family*. The sample's understanding of the need for saving is noteworthy because in the records 10 of the 13 children use the terms "*we should save*" and "*we learned to save*".

Table 3 – Students' written productions

A	"... I was aware that we should <b>save money</b> to have money in the future"
B	"By helping Teresinha to <b>save</b> I became more aware of the need and the importance of <b>saving</b> , because if we do not, we may have money problems in the future."
C	"... I learned to <b>save</b> and also the importance of saving"
D	"...we learned... to <b>save</b> "
E	"...I learned... to <b>save</b> "
F	"I think it's important because ... we can <b>save</b> "
G	"... I learned that you should not spend all your money at once"
H	"It is always good to learn new things. "
I	"Because of the video that the teacher showed I realized that <b>saving</b> is necessary."
K	"I learned more about <b>saving</b> and taught all my family."
L	"I started to manage my money better"
M	"... Whenever I helped Teresinha I was able to <b>save</b> more."
N	"... I do not waste money on things that do not get us anywhere. That's why we should <b>save</b> money. "

It is also possible to understand that something different happened in the acquisition and mobilization of knowledge (Figure 10) because initially (in category 1) the children only mentioned the fact that financial education is a way of saving and, by the end of the project, they had broadened their conception of financial education, putting aside the idea that financial education only "teaches to save". They discovered it teaches to "save adequately", too.

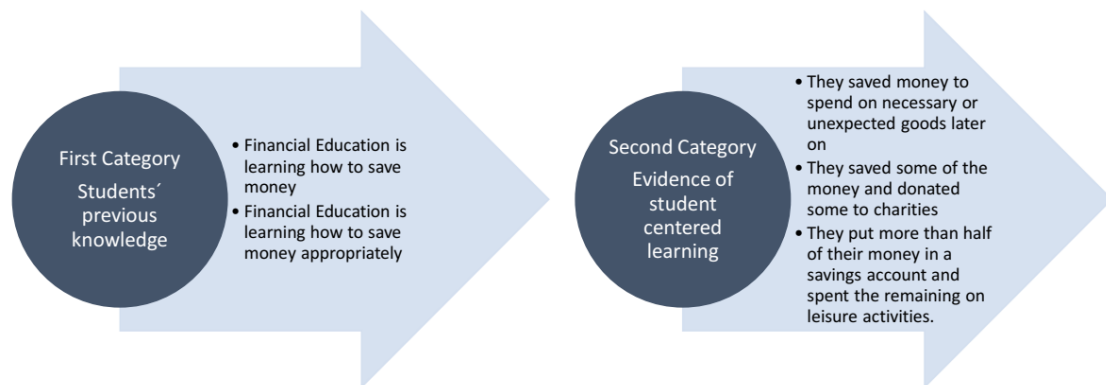


Figure 10: Practical evolution of financial knowledge

Parallel to the use of the word "to save" in the previous analysis, the students used the word "learned" in the consolidation of mathematical knowledge, being an evolutionary indicator in the construction of mathematical knowledge since the children admitted "to have learned to solve problems". It is believed that children were involved in problem solving because they were properly contextualized and, in addition, the way problems were presented (or through videos or games) allowed students to begin to develop a taste for the content implicit in the multiplication of rational numbers.

In the third subcategory - the relationship between financial knowledge and mathematical knowledge - 62% of students showed the ability to link these two domains: i) *in the future we already know how to make the right decisions regarding money ... we learn correct ways of paying what we need ... and we already know how to solve problems about money*; ii) *I made an account of the expenses and made my family know how to save* and iii) *I am having fun while studying*.

Table 4 - Children's written records about the 6th session game

A	<i>"... I made an account of the expenses and made my family learn how to save."</i>
B	<i>."... I calculated expenses and kept the remaining money."</i>
C	<i>"... I learned that we should put money in a savings account ... during the game we made calculations with money ... so in the future I already know how to manage a family income."</i>
D	<i>"... in the future we already know how to make the right decisions about money ... we got to know the right ways to pay for what we need ... and we already know how to solve money problems."</i>
E	<i>"... we got 400 euros so we could manage money ... I'm having fun while studying."</i>
F	<i>"... I think I learned how to manage my money ... I just spent the money I needed."</i>
G	<i>"... I realized that there are things that are not necessary to buy and I learned how to save."</i>
H	<i>"... I think I learned because it was a way of learning to manage money ... I did not spend the whole money, so I kept money."</i>
I	<i>"... I know how to manage money better than before."</i>
J	<i>"... the game had calculations and exercises ... it's as if I had a house and I managed it."</i>
K	<i>"... I learned more because of the simulation games ... we learned how to manage money."</i>
L	<i>"... I learned to manage my money because I had to make choices about what was needed and what was not. I learned how to manage my money."</i>

The third category – Parents/guardians - comprises two subcategories: mathematics and its relationship with financial education and also in relation to the project. In the first, only one of the elements of the sample did not establish a relation between the two dimensions, noting that mathematics is not money. Santos (2012) argues that the school has the responsibility to develop mathematical knowledge, but this progression should be initiated in the family context. On the other hand, in the second subcategory, we tried to understand the parents/guardians conceptions about this project, with half of the sample stating that their child had talked about it and that they had noticed some changes in their children's behaviour, e.g., *"He/she does not make so many tantrums in supermarkets"*. Thus, it is central that parents/guardians are sensitive to the issue of financial education because it is within the family that they learn to deal with money (Pereira, Feitosa, Silvério, & Sousa, 2009).



## 7. Final considerations

Unquestionably, we are in a world where the expression we hear most is "economic crisis", and where the uncertainty of the future persists. Thus, it is fundamental to create moments in which children can build knowledge in the field of financial education, that is, develop the ability to build tools that enable them to manage money properly to be able to have economic stability in the present and in the future. The main benefit of the implementation of this project was undoubtedly the understanding of the applicability of financial education in the discipline of mathematics, in a formal context. However, given its durability, it was not possible to conclude rigorously whether there was an improvement in the context. Nevertheless, it has been possible to respond affirmatively to the research question and it is felt that the aims proposed have been achieved.

It should be noted that the need for the approach of financial education starting during the first years of school is necessary and urgent, especially, its exploitation in context and its meaningfulness for the child.

In this context, it is also necessary to integrate this topic in the initial and continuous training of teachers, since they are agents of change of habits, as well as parents and guardians. The school's role in financial education is to build financial knowledge, develop fundamental skills for an adequate money management, and mathematical knowledge is a facilitating vehicle for this to happen. In this perspective, school should encourage the change of attitudes and behaviours adjusting them to the needs of real life, to create financial discipline, involving the family whenever possible. Therefore, it is fundamental to develop consistent and creative activities and projects adjusted to the needs of today's society.

Although there are difficulties related to the intervention time, this work considered possible to motivate and provide children with significant learning moments in mathematics in connection with the knowledge of financial education, providing more consistent knowledge in the personal and social areas from a perspective of education for citizenship.

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