# A Didactic Proposal with the Subject Financial Education for Middle School

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**ABSTRACT**

This article presents a research on the subject of Financial Education, which aims to contribute to research and construction of didactic activities applicable to High School, which relate mathematical content to this theme. The methodological approach used was the qualitative research, because, through descriptive data, we tried to understand the phenomena involved in the situation under study. Thus, a theoretical contribution was the Olgin's (2015) research on the work with topics of interest for student formation and for the Mathematics Curriculum and another contribution was the research in the Brazilian legislation on the theme Financial Education for High School, aiming at subsidies for the construction of the didactic activities presented. In the analyzes, it was observed that the research participants present adequate knowledge about the mathematical contents involved in the activities, but they have difficulties regarding the labor laws present in a paycheck, as well as in the moment of the decision regarding the most advantageous financial.

**Keywords:** Themes of Interest. High school. Financial Education. Didactic Activities.

## Uma Proposta Didática com o Tema Educação Financeira para o Ensino Médio

**RESUMO**

Apresenta-se, neste trabalho, uma pesquisa sobre a temática Educação Financeira, que visa contribuir para a investigação e construção de atividades didáticas aplicáveis para o Ensino Médio, as quais relacionem os conteúdos matemáticos a esse tema. A abordagem metodológica utilizada foi a pesquisa qualitativa, pois, através de dados descritivos, procurou-se entender os fenômenos envolvidos na situação em estudo. Dessa forma, buscou-se aporte teórico nas pesquisas de Olgin

(2015) sobre o trabalho com temas de interesse para a formação do estudante e para o Currículo de Matemática e na legislação brasileira sobre o tema Educação Financeira para o Ensino Médio, visando subsídios para construção das atividades didáticas apresentadas. Nas análises, observou-se que os participantes da pesquisa apresentam conhecimento adequado sobre os conteúdos matemáticos envolvidos nas atividades, porém têm dificuldades quanto às leis trabalhistas presentes em um contracheque, bem como no momento da tomada de decisão com relação à opção financeira mais vantajosa.

**Palavras-chave**: Temas de Interesse. Ensino Médio. Educação Financeira. Atividades Didáticas.

## INTRODUCTION

According to the National Curriculum Parameters – PCN (Brazil, 1998), students need to work with money, to be able to negotiate and seek their rights, connecting the specific knowledge of the areas of knowledge to practical situations.

For this, one of the main challenges of teachers is to propose activities that relate theory to practice, seeking to make the contents of Mathematics applicable to situations of life in society.

In this sense, the researcher Skovsmose (2001) states that Mathematics developed in the classroom needs to develop mathematical knowledge within the social context, so that the student can reflect on the roles played by the use of mathematics in society.

It complements Olgin (2015) that the school contents can be worked in a contextualized way, through a set of themes that allow the students to develop abilities of interpretation and resolution of problems arising from social, professional and personal life, using the specific knowledge of each area, aiming at the integral formation of students. Also, the official documents indicate the need to work transversally with thematics throughout the School Curriculum.

With this, this article aims to present didactic activities involving the theme Financial Education, allied to mathematical contents.

## THE WORK WITH THEMES IN THE CURRICULUM OF THE MATHEMATICS OF THE HIGH SCHOOL

Olgin (2015) suggests working with themes for the development of mathematical contents of High School in order to provide the student with the development of content through themes of interest that involve relevant aspects of life in society, so that it can establish relationships between theory and the practice.

According to the author, working with themes requires the establishment of criteria for the selection of the same, in order to promote the expansion of the students' knowledge network, contributing to the development of content and the to your formation, so that they use the mathematical knowledge to reflect critically, make conscious decisions and act in society (Olgin, 2015).

The criteria established by the author indicate that Mathematics needs to be developed by providing a critical view of society, as well as taking into account the criteria for evaluating a postmodern curriculum and for the choice and organization of the mathematical contents indicated by the researchers Doll Jr. (1997) and Silva (2009). Figure 1 shows the description of each criterion for selection of themes.

| CRITERION | DESCRIPTION |
|---|---|
| Wealth | Refers to the selection of themes that allow to develop different activities, using different strategies and didactic resources for the construction/expansion of concepts or in order to exercise/review the mathematical contents. |
| Recursion | Refers to the possibility of choosing subjects that allow the student to reflect on the doing, seeking to think and rethink about the paths adopted for the resolution of activities. |
| Relations | Refers to the choice of themes that show the possible connections between them and the contents. |
| Rigor | It is related to the choice of themes that allow to develop the mathematical contents, seeking to verify the methodological and organizational possibilities of the application of the theme. |
| Reflection | It refers to the selection of themes that problematize the question of the social role of Mathematics as a way of transforming society. |
| Reality | It refers to the selection of themes that allow exploring different cultural, political, social or economic contexts, considering the characteristics, needs and interests of each region. |
| Responsibility | It refers to the selection of themes that lead students to realize the impact of their actions, both in their personal and professional lives, as well as in society. |
| Re-signification | It refers to the choice of themes that allow the development of content in different contexts, allowing recontextualizing them. |

Figure 1. Criteria for selecting themes (Adapted from Olgin, 2015).

The search for criteria for the selection of thematics to be studied in High School allows reflection on the importance of elaborating teaching proposals which will enable students to construct a mathematical knowledge that allows them to relate theories to their applicability in life in society, with the objective of forming active and committed individuals with the community in which they are inserted.

To be in consonance with society's current demands, it is necessary for the school to address issues that interfere with the lives of students and with which they are confronted in their daily lives. The National Curricular Parameters – PCN (Brazil, 1997) suggest the transversal treatment of social themes in the school, as a way to contemplate them in their complexity, without restricting them to the approach of a single area of knowledge.

Agreeing with the PCN (1997), the National Curricular Common Base (Brazil, 2018) indicates that it is up to the education systems and the schools to incorporate to curricula and the pedagogical proposals into contemporary themes that affect human life at a local, regional and global, preferably of form cross-sectional and integrative. Among these themes, we highlight: consumer education, financial education, tax and labor.

In this article, we will emphasize the Financial Education theme, aiming to work with issues related to reality involving the mathematical contents, because if they have a close relationship to objectively existing social problems the approach of these concepts mathematical can be made taking into account the issues related to life in society.

Therefore, working with themes requires the establishment of criteria for the selection of the same, in which the problems studied should be relevant for students and enable the development of mathematical contents.

## THE FINANCIAL EDUCATION THEME IN THE BRAZILIAN LEGISLATION

In order to search for subsidies on the theme of Financial Education, we initially investigated the Constitution of the Federative Republic of Brazil, which establishes that Education is a social right, which should provide people with the necessary knowledge to exercise and enjoy their rights of the form egalitarian(Brazil, 1988).

The issue described refers to the purpose of Basic Education, which is the development of the learner, guaranteeing a knowledge that allows him to act effectively in society. This knowledge is necessary, so that he can exercise his citizenship and progress, both in relation to his personal and professional life, and in his later studies (Brazil, 1996).

In the National Curriculum Parameters – PCN (BRAZIL, 1998) also allege that teaching should not be compartmentalized, but contextualized, relating the specific knowledge of the areas to practical situations.

Complement the National Curriculum Parameters of High School – PCNEM (Brazil, 2000) that the transformations that the Brazilian High School goes through, with the changes of the modern world, demand changes in the process of teaching and learning, since the disciplines of High School can't to be based on accumulating knowledge, nor on the memorization of formulas and concepts, since life in society now requires the student to be prepared to act within the technological reality in which he lives, knowing how to search, analyze and select information.

For this preparation for reality, it is suggested to approach the theme of Financial Education in High School Mathematics classes, not aiming at memorizing formulas and calculations that do not develop the capacity to reflect and analyze the results obtained. The true understanding of Financial Education is presented in the PCNEM (Brazil, 2000, p.79), which describe:

> One form to master mathematical concepts is by relating them to economic and statistical index analysis, to political projections, or to the estimation of interest rates, associated with all the personal, political, and social meanings that numbers of this nature carry.

The Rio Grande do Sul Curriculum frameworks (2009) also address the issue of Financial Education, mentioning that this theme brings issues of daily life widely disseminated in the media and that need to be worked on in the classroom, because they allow to develop problem situations of the day-to-day.

The Curriculum Guidelines for High School (DCNEM) indicate that Financial Mathematics can be approached using the contents of Mathematics itself, as in the study of the exponential function, to work interest and monetary correction, in the development of activities that allow the contact technological resources, since they are widely used in the present day (Brazil, 2006).

In this sense, we can see the importance of Financial Education for the Brazilian citizen, since the Federal Government established the National Strategy for Financial Education, through Decree 7,397, dated December 22, 2010, which seeks to encourage the study of Financial Education and previdentiary, so that citizens can make sensible decisions (Brazil, 2010).

In addition, in the National Curricular Common Base for High School, the importance of this theme can be evidenced in the abilities presented in Figure 2.

| ABILITIES |
|---|
| Interpret economic, social and natural sciences situations that involve the variation of two magnitudes, by analyzing the graphs of the functions represented and the rates of variation with or without the support of digital technologies. |
| Interpret rates and indexes of socioeconomic nature, such as human development index, inflation rates, among others, investigating the calculation processes of these numbers. |
| Solve and elaborate problems with exponential functions in which it is necessary to understand and interpret the variation of the quantities involved, in contexts such as Financial Mathematics and the growth of microscopic living beings, among others. |
| Solve and elaborate problems with logarithmic functions in which it is necessary to understand and interpret the variation of the quantities involved, in contexts such as earthquakes, pH, radioactivity, Financial Mathematics, among others. |
| To investigate points of maximum or minimum of quadratic functions in Financial Mathematical or Kinematic contexts, among others. |

Figure 2. Abilities that contemplate the subject Financial Education in High School (Adapted from Brazil, 2018).

Taking into account the research carried out in the official documents, it is important to develop the mathematical contents related to the subject of Financial Education, with the purpose of forming conscious and committed citizens, to act effectively in the society in which they live.

## RESEARCH METHODOLOGY

The research methodology had a qualitative approach, which makes it possible to describe and analyze the object of study, based on the researcher's vision and the obtaining of descriptive data, obtained between the direct contact of the researcher with the studied situation. Thus, it focuses on the process, the which it is concerned with portraying the participants' perspective (Oliveira, 2010).

Thus, this work was developed in six stages. The first stage was the research on the criteria for the selection of themes according to Olgin (2015); the second was the research on the subject Financial School Education for High School in the brazilian legislation; the following was the elaboration of didactic activities; the fourth was the construction and application of a previous questionnaire to characterize the class and their previous knowledge; the fifth stage was the application of didactic activities with the theme Financial Education; and the last one was the analysis of the results obtained during application the questionnaires and the of activities.

The research was approved by the Human Research Ethics Committee of the Lutheran University of Brazil, having as number 59961916.9.0000.5349 the Certificate of Presentation for Ethical Appreciation.

The experiment was applied, in August and September, in three meetings, totaling 6 hours class, in the class 301, 3rd year of the Our Lady of Lourdes College, in the city of Farroupilha, Rio Grande do Sul. The class 301 was formed by seven girls and eight boys, with age group of 16 to 18 years.

## EXAMPLES OF EDUCATIONAL ACTIVITIES FOR HIGH SCHOOL INVOLVING THE THEME FINANCIAL EDUCATION

Based on the theme Financial Education, the following four activities were built.

### Activity 1 – Payment at the time of purchase or after?

To approach the payment at the time of purchase or after, it was decided to present an activity involving the subject Financial Education that instigated financial thinking and the analysis of everyday situations, according to Figure 3.

> What's better: A stereo is sold in cash for R$ 248.00 or 3 times of R$ 100.00 without entrance. If the customer can apply their money to 10.8% per month, which of the two payment options is more advantageous?

*Figure 3.* Activity involving the payment at the time of purchase or after (Adapted from Hazzan and Pompeo, 2014).

This activity can provide an analysis of the best buying decision. According to Hazzan and Pompeo (2015), the procedure consists of calculating the current value of the forward payment and comparing it with the spot price. In addition, according to Hofmann and Moro (2012), household indebtedness occurs due to lack of financial knowledge, which in this case indicates the evaluation of the purchase options. In this activity, the criteria *Recursion* and *Responsibility* are perceived, as it allows the student to reflect on the problematic in question, seeking to reason on the paths adopted for the resolution of the same, leading him to perceive the impact of his actions.

Two possibilities for analysis and resolution of the proposed situation will be presented below.

**Resolution 1:** First, the buyer wants to know how much to apply so that in each month he obtains the R$ 100.00 of the installment.

In this analysis, it is considered the value of each installment that the buyer must apply at the beginning of the purchase so that, at the end of each month, he has the R$ 100.00 of the installment, as explained in Figure 4.

Term payment with the value of each installment separately.
The following formula of the compound interest amount shall be used: $M = C \cdot (1+i)^n$

$M$ = Amount     $C$ = Capital to be applied     $i$ = Rate     $n$ = Period

| Period | Amount | Applied Capital |
|---|---|---|
| 1° mês | $100 = C_1 \cdot (1+0{,}108)^1$ | $C_1$ = R$ 90,25 |
| 2° mês | $100 = C_2 \cdot (1+0{,}108)^2$ | $C_2$ = R$ 81,45 |
| 3° mês | $100 = C_3 \cdot (1+0{,}108)^3$ | $C_3$ = R$ 73,51 |

From the table, it can be observed that R$ 90.25 + R$ 81.45 + R$ 73.51 = R$ 245.21. Therefore, the best option is to pay the term (because R$ 245.21 < R$ 248.00).

*Figure 4.* Resolution with the value of each installment separately.

From the resolution, it is observed that, despite the little difference, the value of the sound equipment with payment after is R$ 2.79 less than the cash value, through this perspective, the payment after purchase is financially more advantageous.

**Resolution 2:** Another possibility for analysis would be to consider the R$ 300.00 as a single investment.

In this possibility of analysis, the buyer has the full value of the purchase in installment and decides to apply it in full. At the end of each month, he pays the R$ 100.00 of the installment and does not withdraw the interest earned during the month, reapplying this interest in the next month, as explained in Figure 5.

Price to view: R$ 258.00
Forward payment without interest withdrawal:

| Period | Amount | Payment |
|---|---|---|
| 1° month | R$ 300.00 x 1.108 = 332.40 | R$ 100.00 |
| 2° month | R$ 232.40 x 1.108 = 257.49 | R$ 100.00 |
| 3° month | R$ 157.49 x 1.108 = 174.49 | R$ 100.00 |

From the table, it is observed that R$ 300.00 - R $ 74.49 = R $ 225.51. Therefore, the best option is to pay the term (since R$ 225.51 < R$ 248.00).

Figure 5. Resolution without interest withdrawal.

From the second resolution presented, it is observed that the difference is greater than in the first resolution, since the value of the sound equipment paid in installments is R$ 22.49 lower than the cash value, confirming that the purchase on time, in this situation, it is financially more advantageous.

The analyzes presented represent possible discussions in the classroom and can stimulate high school students to think financially. In this activity involving payment in cash and in the term, only two possibilities of analysis were presented, which do not exhaust other possible points of view.

## Activity 2 – Financing (amortization systems PRICE and SAC)

This activity involves the real estate financing issue that, according to Hofmann and Moro (2012), is a subject that needs to be explored in Basic Education, since it is important for the decision making regarding the financing options that can be used the PRICE (French de Amortizacion System) or the SAC (Constant Amortization System), according to Figure 6. In this activity, the criteria *Reality*, *Wealth* and *Recursion* are perceived, because it uses different strategies for the expansion of concepts and to revisit the mathematical contents. It also allows the student to reflect on the subject presented, in addition to highlighting the criterion *Relations* between mathematical content and the theme financing real estate.

2- João and Carla are a young couple who decided to buy their first property. The idea is to buy an apartment that costs $ 200 thousand reais in eight times. The construction company directly finances this amount under the following conditions: R$ 200 thousand in 8 installments with 3% interest per month by the amortization system SAC or PRICE.

*Figure 6.* Activity on financing using PRICE or SAC table (Adapted from Hazzan and Pompeo, 2014).

On finance, Hofmann and Moro (2012) point out that the Organization for Economic Cooperation and Development (OCDE) highlights financial literacy as (the ability to make effective financial decisions through the ability to make judgments) being increasingly essential so that the Brazilian family know identify the most appropriate option to reach the balance of its budget, making the right decision on the financing options. Under the *Responsibility* criterion, this subject may lead the students to perceive the impacts of their actions on their personal life and in society, since a determined decision of financing can compromise the financial health of your family the long term. Through activity 2, the *responsibility* can be exercised when the student perceives the financial impact on the family budget, analyzing the installments, interest and period of the expenditure involving the chosen financing.

*Resolution 1:* Figure 7 shows the resolution of the financing activity using the PRICE table. This activity provides the application of percentage calculations and compound interest with the possibility of using the calculator and/or electronic spreadsheets as a facilitator in calculations.

For the construction of the PRICE table we must calculate:

- Provision: $P = PV \cdot \dfrac{(1+i)^x \cdot i}{(1+i)^x - 1} = 200000 \cdot \dfrac{(1+0.03)^8 \cdot 0.03}{(1+0.03)^8 - 1}$

  P = installment = R$ 28,491.28

  PV = Valor Presente (borrowed capital).
- Interest = 3% on the outstanding balance

  Interest of the 1st month = 3% de R$ 200,000.00 = R$ 6,000.00
- Amortization = Provision – Interest

  Amortization of the 1st month = R$ 28,491.28 - R$ 6,000.00 = R$ 22,491.28
- Debtor Balance = R$ 200,000.00 – Amortization.

  Debtor Balance of the 1st month = R$ 200,000.00 - R$ 22,491.28 = R$ 177,508.72.

Organization of data in a spreadsheet:

| Period | Provision | Amortization | Interest | Outstanding Balance |
|--------|-----------|--------------|----------|---------------------|
| 0 | | | | R$ 200.000,00 |
| 1 | R$ 28.491,28 | R$ 22.491,28 | R$ 6.000,00 | R$ 177.508,72 |
| 2 | R$ 28.491,28 | R$ 23.166,02 | R$ 5.325,26 | R$ 154.342,71 |
| 3 | R$ 28.491,28 | R$ 23.861,00 | R$ 4.630,28 | R$ 130.481,71 |
| 4 | R$ 28.491,28 | R$ 24.576,83 | R$ 3.914,45 | R$ 105.904,88 |
| 5 | R$ 28.491,28 | R$ 25.314,13 | R$ 3.177,15 | R$ 80.590,75 |
| 6 | R$ 28.491,28 | R$ 26.073,56 | R$ 2.417,72 | R$ 54.517,20 |
| 7 | R$ 28.491,28 | R$ 26.855,76 | R$ 1.635,52 | R$ 27.661,43 |
| 8 | R$ 28.491,28 | R$ 27.661,43 | R$ 829,84 | -R$ 0,00 |

Figure 7. Resolution of the activity on financing using the PRICE table.

*Resolution 2:* in Figure 8, the resolution of the financing activity is presented using the SAC table. This activity provides the application of percentage and compound interest calculations with the possibility of using the calculator and electronic spreadsheets as a technological resource.

For the construction of the SAC table, one must calculate:

- Interest = 3% on the balance due.
- 1st month 3% de R$ 200,000.00 = R$ 6,000.00
- Amortization = R$ 200,000.00 / 8 = R$25,000.00
- Provision: Amortization + Interest
- Provision of the 1st month = R$ 25,000 +R$ 6,000 = R$ 31,000.00
- Debtor balance = R$ 200,000.00 - Amortization
- Debtor balance of the 1st month = R$ 200,000.00 – R$25,000.00 = R$ 175,000.00

Organization of data in a spreadsheet:

| Period | Provision | Amortization | Interest | Outstanding Balance |
|---|---|---|---|---|
| 0 | | | | R$ 200.000,00 |
| 1 | R$ 31.000,00 | R$ 25.000,00 | R$ 6.000,00 | R$ 175.000,00 |
| 2 | R$ 30.250,00 | R$ 25.000,00 | R$ 5.250,00 | R$ 150.000,00 |
| 3 | R$ 29.500,00 | R$ 25.000,00 | R$ 4.500,00 | R$ 125.000,00 |
| 4 | R$ 28.750,00 | R$ 25.000,00 | R$ 3.750,00 | R$ 100.000,00 |
| 5 | R$ 28.000,00 | R$ 25.000,00 | R$ 3.000,00 | R$ 75.000,00 |
| 6 | R$ 27.250,00 | R$ 25.000,00 | R$ 2.250,00 | R$ 50.000,00 |
| 7 | R$ 26.500,00 | R$ 25.000,00 | R$ 1.500,00 | R$ 25.000,00 |
| 8 | R$ 25.750,00 | R$ 25.000,00 | R$ 750,00 | R$ - |

*Figure 8*. Resolution of the activity on financing using SAC table (The authors).

In order to solve the problem, the student needs to understand what is being asked, to withdraw the relevant information and, starting from that point, to start the calculations for the initial construction of the table, which will require knowledge of percentage and compound interest, electronic spreadsheets as a resource facilitator.

By organizing the data in a electronic spreadsheet, it can be noted that in the amortization system PRICE, monthly amortization increased while interest rates were reduced. The sum of monthly amortization and monthly interest totals the amount of the monthly installment, which remained constant at R$ 28,491.28. With this, it is observed that the amount paid by the property (sum of 8 installments) is R$ 227,930.22, in which R$ 27,930.22 is interest.

Based on the electronic spreadsheet, it can be seen that, in the SAC amortization system, the monthly amortization was a constant value of R$ 25,000.00 and benefits reduced monthly from R$ 31,000.00, in the first month, to R$ 25,750.00 in the last month. The amount paid by the property is the sum of all eight installments that totaled R$ 227,000.00. Therefore, R$ 27,000.00 represents the interest paid by the couple.

Therefore, the payment for the PRICE system resulted in a total of R$ 227,930.22 and, through the SAC system, the total was R$ 227,000.00, and it can be concluded that there is a difference of R$ 930.22, pointing out the SAC system as the most economical.

## Activity 3 – Investments (Enem)

This activity was withdrawn from the 2011 National High School Examination (Enem), which involves the comparison between two investments, savings and investment in CDB (certificate of bank deposit), according to Figure 9.

A young investor needs to choose which investment will bring the greatest financial return on an application of $500.00. To do this, it investigates the income and the tax to be paid in two investments: savings and CDB (certificate of bank deposit). The information obtained is summarized in the table:

| | Monthly income (%) | IR (income tax) |
|---|---|---|
| SAVINGS | 0.560 | ISENTO |
| CDB | 0.876 | 4% (on the gain) |

For the young investor, at the end of a month, the most advantageous application is
A) savings, since it will total an amount of R$ 502.80.
B) savings, since it will total an amount of R$ 500.56.
C) the CDB, since it will total an amount of R$ 504.38.
D) the CDB, since it will total an amount of R$ 504.21.
E) the CDB, since it will total an amount of R$ 500,87.

Figure 9. Investment activity – savings or CDB (Retired from Brazil, 2011, notebook 5 of the second day, p.25).

This activity can favor the analysis of the best investment decision based on the percentages of monthly income and the discount of Income Tax (IR). The criteria *Wealth* and Recursion can be seen in the activity, since it allows revisiting contents and enlarge concepts, allowing the student to reflect on the paths adopted, as well as the *Reality* criteria, since it allows exploring different economic contexts and the criterion *Accountability*, that enables the student to ascertain the consequences of their actions in their life.

**Resolution:** Figure 10 presents a possibility for analysis and resolution of the proposed situation.

For the resolution, it is enough to calculate the gain on the investments and to discount the tariffs:

| | |
|---|---|
| • **Savings** = 0.56% x 500 = R$ 2.80 | • **CDB** = 0.876% x 500 = R$ 4.38 |
| • Amount = 500 + 2,80 = R$ 502,80 | • Amount = 500 + 4.38 = R$ 504.38 |
| | • Rate = 4% x 4.38 = R$ 0.1752 |

The total amount with the savings application is R$ 502.80 while the total amount with the application in the CDB is R$ 504.38 - R $ 0.1752 = R$ 504.21.
CORRECT ANSWER: letter D, the CDB, since it will total an amount of R$ 504.21.

Figure 10. Resolution of the activity on investments – savings or CDB.

To solve the question, the student needs to have prior knowledge of percentage. It allows us to understand that, when investing in savings, although the percentage of income is low, there is no IR discount, while in other investments there is.

## Activity 4 – Paycheck

This activity involves the issue of salary, through a daily situation of a worker who, after checking his payroll, wants to understand how the benefits and discounts on his paycheck are calculated, according to Figure 11.

An employee who receives a monthly contractual salary of R$ 4,400.00 and has a monthly workload of 220 hours, worked 15 extraordinary hours in the month remunerated to 50%, which is composed of 24 business days and 06 Sundays and holidays. The Transportation Receipt received is R $ 4.05 and the employee needs four VT per day. The Meal Valley paid by the company is R$ 20.00 per day worked.

Paycheck

| Earnings | | |
|---|---|---|
| Salary | R$ | 4,400.00 |
| Overtime 50% (15 hours) | | |
| DSR overtime 50% | | |
| Transportation vouchers | | |
| Meal earnings | | |
| **Total earnings** | | |

| Discount | |
|---|---|
| VT | |
| INSS | |
| IRRF | |
| *Total discounts* | |
| *Net value* | |

| FGTS | |
|---|---|

Figure 11. Activity on paycheck (Adapted from Rufatto, 2008).

In this activity, one observes the criterion *Riqueza*, which allows to develop activities related to the work theme, aiming to broaden concepts and revisit the mathematical contents. It is notorious the criterion *Relations* between mathematical contents and labor issues. The criterion *Ressignification* in the development of contents in different contexts is also perceived. Also *Reality*, because it explores the contexts of the relations between benefits and discounts, considering the situation of an employee. For the calculations and filling of the employee's paycheck, it is necessary to use the rate table for collection purposes to the INSS, according to Figure 12.

| SALÁRIO DE CONTRIBUIÇÃO (R$) | ALÍQUOTA PARA FINS DE RECOLHIMENTO AO INSS |
|---|---|
| até 1.659,38 | 8% |
| de 1.659,39 até 2.765,66 | 9% |
| de 2.765,67 até 5.531,31 | 11% |

*Figure 12.* Aliquot rate table for collection purposes of the INSS / 2017 (Recovered from Brazil, 2017a).

The Withholding Income Tax (IRRF) deduction also requires the consultation the a rates table, according to Figure 13.

| Base de cálculo mensal em R$ | Alíquota % | Parcela a deduzir do imposto em R$ |
|---|---|---|
| De 1.903,99 até 2.826,65 | 7,5 | 142,8 |
| De 2.826,66 até 3.751,05 | 15 | 354,8 |
| De 3.751,06 até 4.664,68 | 22,5 | 636,13 |
| Acima de 4.664,68 | 27,5 | 869,36 |

*Figure 13.* IRRF/2017 aliquot table (Recovered from Brazil, 2017b).

After this information, it is necessary to know how the benefits (receipts) and discounts should be calculated (Figure 14).

**Calculation of Overtime (HE)**
- Monthly, there are 220 hours of work, simply dividing the monthly salary by the hours worked in the month to find the value of the overtime worked:
  4.400/220 = R$ 20,00 for hours
- The employee did 15 extra hours, so:
  20 x 15 = R$ 300,00

**Calculation of Weekly Paid Rest (DSR)**
- In the month worked, there are 6 Sundays and holidays and 24 working days, with overtime in the month divided by the working days in the month, resulting in the value of the DSR over the 50% overtime. So, just do:300/24 = R$12,50
- Since there are 6 days of DSR, then:
  12,50 x 6 = R$ 75,00

**calculation of the value of the transport voucher (VT)**
- The employee needs 4 VT per day and each costs R $ 4.05, so:
  4 x 4,05 = R$ 16,20
- Since there are 24 days worked, then:
  16,20 x 24 = R$ 388,80
- **Meal Valley Calculation (VR)**
- As the employee receives R $ 20.00 VR per day worked, without discount on the paycheck, then:
  20,00 x 24 = R$ 480,00

**Total calculation of earnings**
- To finish, simply add the values of salary, overtime, DSR, VT and VR, to obtain:
  4400 + 300 + 75 + 388,80 + 480 = R$ 5.643,80

**Paycheck**

| Earnings | |
|---|---|
| Salary | R$ 4.400,00 |
| Overtime 50% (15 horas) | R$ 300,00 |
| DSR overtime 50% | R$ 75,00 |
| Value of the transport voucher | R$ 388,80 |
| Meal Valley | R$ 480,00 |
| *Total of earnings* | *R$ 5.643,80* |

*Figure 14.* Resolution of the earnings of the activity of the paycheck.

After calculating the earnings it is necessary to calculate the deductions, so that the employer knows exactly how much he is entitled to receive (Figure 15).

**Transportation Calculation**
- The employee needs 4 VT per day and each one costs R$ 4.05, then:
  $4 \times 4.05 = R\$ 16.20$
- Since there are 24 days worked, then:
  $16.20 \times 24 = R\$ 388.80$
- There is, in the Brazilian legislation, an expected discount of 6% on salary, then:
  $6\% \times 4400 = R\$ 264.00$
- Therefore, the value of the VT for the 24 days, to be deducted from the employee, is the lowest value between the total value of the transportation vouchers and the discount of 6% of the salary, then: R$ 264.00

**INSS calculation**
- According to the constant salary range in the rate table for INSS collection purposes, the discount percentage is 11%, therefore:
  $11\% \times 5,643.80 = R\$ 620.81$

**IRRF calculation**
- The consultation of the quotation basis in the IRRF rate table should be made, discounting the total of INSS income.
  $5,643.80 - 620.81 = R\$ 5,022.99$ (salary range at the rate of 27.5%)
  $5,022.99 \times 27.5\% = R\$ 1,381.32$
  This amount is deducted at a constant rate in the table of R$ 869.36:
  $1,381.32 - 869.36 = R\$ 511.96$

**Calculation of total discounts**
- Added the discounts of the VT, INSS and IRRF:
  $264.00 + 620.81 + 511.96 = R\$ 1,396.77$

**Calculation of the salary liquid**
- The Net value is calculated with the total value of the profits subtracted from the total value of discounts, then:
  $5,643.80 - 1,396.77 = R\$ 4,247.03$

**FGTS Calculation**
- The FGTS (Guarantee Fund for Length of Service) is not deducted from the employee, but from the employer, in the amount of 8% of the total of the benefits:
  $8\% \times 5,643.80 = R\$ 451.50$

**Paycheck**

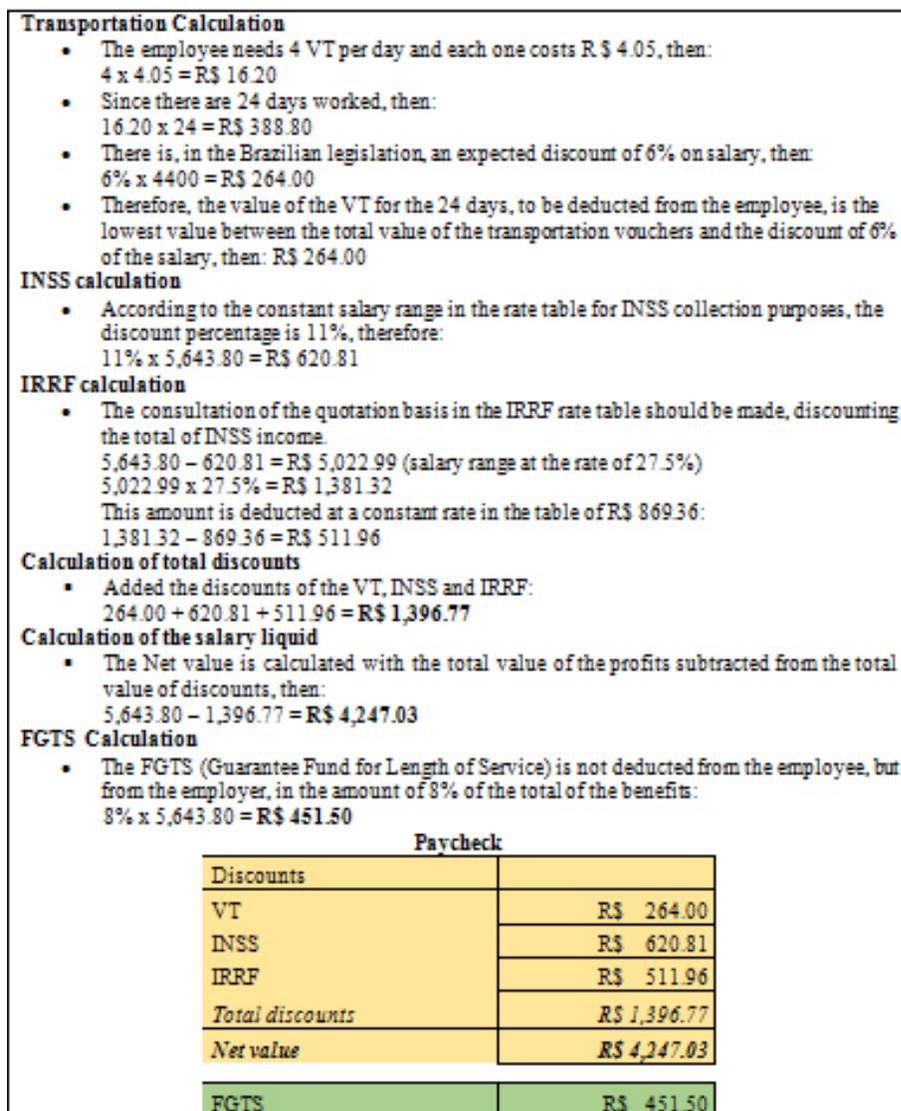| Discounts | |
|---|---|
| VT | R$ 264.00 |
| INSS | R$ 620.81 |
| IRRF | R$ 511.96 |
| Total discounts | R$ 1,396.77 |
| Net value | R$ 4,247.03 |
| | |
| FGTS | R$ 451.50 |

Figure 15. Resolution of the activity discounts on the paycheck.

After the research, analysis, construction and resolution of the four activities described, the researchers began the process of applying to high school students for the proper analysis of the results.

# ANALYSIS OF ACTIVITIES DEVELOPED WITH THE SCHOOL FINANCIAL EDUCATION SUBJECT

The questionnaire applied before the development allowed to verify that eight students work in the sales areas and administrative routines.

Nine students said that their families plans their spending, using spreadsheets and evaluating the need for the purchase, and six students pointed out that their family does not plan spending, but all consider it important to save, considering that it is a guarantee of future, if there is some unforeseen.

When questioned about how important money should be to people, students responded that it should bring improvements to life, serve to conquer material assets, maintain a good standard of living and some students wrote that money is very important because without it is not possible to live.

School Financial Education for students is to not spend on unnecessary things, control money and learn how to take care of expenses and make better choices of the form of payment.

The next moment was the application of the activities, in which the students worked in groups, which were denominated groups G1, G2, G3, G4 and G5.

During the application of the activities, the objectives of the experiment were explained to the students. In activity 1 involving the payment at the time of purchase or after, G1 students presented the following solution, according to Figure 16.



*Figure 16*. Resolution of activity 1, performed by the students of group G1.

The students of the G1 performed the calculations properly, since they used the formula of the compound interest, demonstrated mastery of the calculations involving potencies, percentages and fractions. They opted for payment in installments of R$ 100.00, with a yield rate of 10.8%.

Despite this, the group students made a mistake in writing the answer in the upper left corner of Figure 16. Although they found that the term value was more advantageous than the cash value, they replied that "it is better to invest in the plots and then buy the equipment in sight".

In the next activity, on financings, the PRICE and SAC tables of the G3 students are presented, which correctly filled the fields yield, amortization, interest and debit balance (Figure 17).

### PRICE

| Período | Prestação | Amortização | Juros | Saldo Devedor |
|---|---|---|---|---|
| 0 | | | | R$ 200.000,00 |
| 1 | 2849,28 | 22049,28 | 6000 | 177508,72 |
| 2 | 2849,28 | 23166,02 | 5895,26 | 154342,70 |
| 3 | 2849,28 | 23861 | 4630,28 | 130481,70 |
| 4 | 2849,28 | 24505,15 | 3914,45 | 106005,25 |
| 5 | 4849,28 | 25364,70 | 3176,38 | 80574,15 |
| 6 | 2849,28 | 26074,15 | 2417,72 | 54497 |
| 7 | 2849,28 | 26653,37 | 1624,91 | 27650,63 |
| 8 | 2849,28 | 22661,21 | 129,22 | 0 |

### SAC

| Período | Prestação | Amortização | Juros | Saldo Devedor |
|---|---|---|---|---|
| 0 | | | | R$ 200.000,00 |
| 1 | 31000 | 25000 | 6000 | 175000 |
| 2 | 30250 | 25000 | 5260 | 150000 |
| 3 | 29500 | 25000 | 4500 | 125000 |
| 4 | 27750 | 25000 | 3750 | 100000 |
| 5 | 52250 | 25000 | 3000 | 75000 |
| 6 | 27250 | 25000 | 2250 | 50000 |
| 7 | 26500 | 25000 | 1500 | 25000 |
| 8 | 26425 | 25000 | 750 | 0 |

*Figure 17.* Resolution of activity 2, carried out by the students of group G3.

In Figure 18, it can be noted that the G4 students demonstrated the calculations in an organized way, inserting the results in the worksheets. They presented, clearly, the domain of the resolutions on the SAC table in the calculations of the monthly values of the amortization, interest and debit balance.
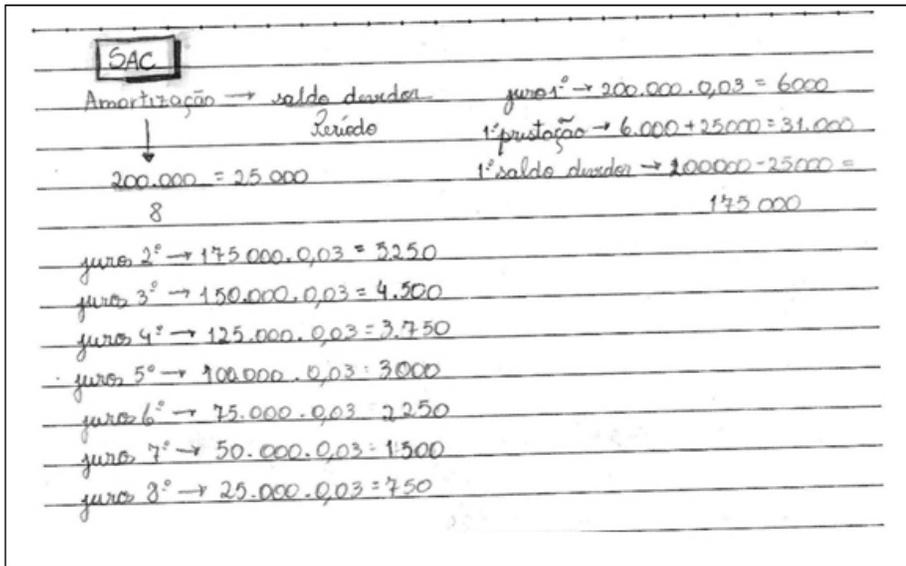
*Figure 18*. Resolution of activity 2, carried out by the students of group G4.

The G4 students also organized the calculations and showed the way to solve the calculations of the PRICE table, according to Figure 19.

PRICE

$$P = P_V \cdot \frac{(1+i)^n \cdot i}{(1+i)^n - 1} \quad \rightarrow \quad P = 200.000 \cdot \frac{(1+0.03)^8 \cdot 0.03}{(1+0.03)^8 - 1}$$

$$P = \frac{7600,62}{0,26677} = \boxed{28.491,28}$$

1°) juro → 200.000 . 0,03 = 6000
Amortização → P - j → 28.491,28 - 6000 = 22.491,28
S. devedor → Pv - A = 200.000 - 22.491,28 = 177.508,72

2°) juro → 177.508,72 . 0,03 = 5.325,26
Amortização → 28.491,28 - 5.325,26 = 23.166,02
S. devedor → 177.508,72 - 23.166,02 = 154.342,7

3°) juro → 154.342,70 . 0,03 = 4630,28
Amortização → 28.491,28 - 4.630,22 = 23.861
S. devedor → 154.342,7 - 23.861 = 130.481,7

4°) juro → 130.481,70 . 0,03 = 3914,45
Amortização → 28.491,28 - 3914,45 = 24.576,83
S. devedor → 130.481,7 - 24.576,83 = 105.904,27

5°) juro → 105.904,27 . 0,03 = 3177,15
Amortização → 28.491,28 - 3177,15 = 25.314,13
S. devedor → 105.904,27 - 25.314,13 = 80.590,74

6°) juro → 80.590,74 . 0,03 = 2417,72
Amortização → 28.491,28 - 2417,72 = 26.073,56
S. devedor → 80.590,74 - 26.073,56 = 54.517,18

7°) juro → 54.517,18 . 0,03 = 1635,52
Amortização → 28.491,28 - 1635,52 = 26.855,76
S. devedor → 54.517,18 - 26.855,76 = 27.661,42

8°) juro → 27.661,42 . 0,03 = 829,84
Amortização → 28.491,28 - 829,84 = 27.661,44
S. devedor → 27.661,42 - 27.661,44

Price = 227.930,24
Sac = 253.000 → 30.069,76

*Figure 19.* Resolution of activity 2, carried out by the students of group G4.

It is also possible to observe the proper interpretation characteristics presented by the students of group G4 from the writing of letters (variables) to represent the formulas, such as P (installment), j (interest), Pv), A (amortization), P-j (to calculate the amortization) and Pv-A (to calculate the outstanding balance).

At the time of conclusion, the members of the G4 group correctly resolved the payment of the property through the financing of the PRICE rate of R$ 227.930,24, however, the total of the SAC table found by them was R$ 258.000,00, instead of R$ 227.000,00. They found a difference of R$ 30.069,76 that would indicate PRICE as the most advantageous, while the correct difference between the amortization systems of activity 2 is R$ 930,22, in which the SAC table presents a more advantageous to the couple.

In the Enem question, the G2 students were used as an example of resolution, according to Figure 20.



Figure 20. Resolution of activity 3, carried out by the students of group G2.

Said group correctly interpreted the question and correctly calculated the amount of the application in savings, which they called a gain, in the amount of R$ 502,80. As for the CDB, they correctly realized the 4% discount on the gain, resulting in a final amount of R$ 504,20, which is the most advantageous investment option.

In the activity involving the paycheck, the groups presented difficulties, according to Figure 21.

**Revenue calculation**

| | | |
|---|---|---|
| Salário | R$ | 4.400,00 |
| Horas extras 50% (15 horas) | 20.1,5.15=450 | |
| DSR sobre hora extra 50% | 450÷24.6=112,5 | |
| Vale Transporte | 4400.6%=264 +388,8-264=124,8 | |
| Vale Refeição | 20.24=480 | |
| *Total de proventos* | 5567,30 | |

**Discount Calculations**

| | |
|---|---|
| INSS | 5567,3.11%=612,40 |
| IRRF | 5567,3 - 612,40=4954,90 .27,5% = 1362,60 - 869,36 |

**FGTS calculation**

| | |
|---|---|
| FGTS | 5567,30.8%=445,40 |

*Figure 21*. Resolution of activity 4, carried out by the students of group G4.

In this figure, it is observed that the difficulty of the students was not with the mathematical contents, but with respect to the specific procedures to calculate the proceeds, the discounts and the FGTS, although the teacher worked each of them. The students of this group correctly filled in the fields of transportation and meal value, but presented problems of understanding the procedures for calculations of INSS, IRRF and FGTS.

## FINAL CONSIDERATIONS

In this work, it was observed that the activities involving the subject Financial School Education enabled the students to work on issues related the payment at the time of purchase or after, financing, investments and labor laws, through the study of a paycheck, allied to mathematical contents from highschool. In addition, cooperation was seen in group work that generated discussions on strategies for problem solving.

In this research, the didactic activities developed allied the mathematical contents of percentage, potentiation, fractions, increases and discounts, compound interest, rule of three, through different problem situations. In addition, in the activity involving real estate financing, it was observed that the activity can explore the Reflection criterion by promoting discussions about government programs, such as my home, my life.

It was observed that the participants of the research have, in general, adequate knowledge about the mathematical contents involved in the activities, but they have difficulties regarding the labor laws present in a paycheque, as well as in the moment of the decision with respect to the financially more option advantageous.

The themes suggested by Brazil (1997, 2018) make it possible to expand the knowledge network of students, aiming at their integral formation. The criteria for selection of themes provided an opportunity to identify the potentialities of the chosen theme, Financial Education, aiming at an educational practice that allows to relate contemporary themes to mathematical contents. The proposed didactic activities can be adapted to each school reality and the teacher can improve them, as the profile of the students he intends to form is appropriated.

The results show that this theme should be developed in the secondary school mathematics curriculum, so that the school can take ownership of the responsibility to train citizens who are conscious and committed to the world in which they live, and that the student himself develops the ability to decide financially through the legal and beneficial option for your life.

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