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Does financial education impact school attainment? Experimental evidence from Brazil

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Does Financial Education Impact School Attainment? Experimental Evidence from Brazil*

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Abstract

Can an applied mathematics curriculum enhance student intrinsic motivation and improve math achievement? We tackle this question through a randomized control trial of a program that integrates financial education into the mathematics curriculum in Brazil. Spanning 190 public schools and over 15,000 students, our study reveals that the program significantly boosts students' interest in mathematics and enhances financial literacy and math performance, particularly among students from poorer socioeconomic backgrounds. Initially, the program strengthens these students' internal locus of control and broad interest in mathematics during the first year. By the second year's conclusion, it positively impacts their financial literacy, math proficiency, and specific socio-emotional skills crucial for the labor market. However, we do not observe significant changes in self-reported financial behaviors or attitudes as measured by a financial autonomy index.

Keywords: Financial Education, School Attainment, Socio-emotional Skills, Youth, Randomized Controlled Trials. *JEL Codes:* G53, I21, J24, O12.

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1 Introduction

Proficiency in mathematics is a critical component of human capital accumulation, instrumental in enhancing analytical thinking, problem-solving capabilities, and decision-making skills - attributes that are known determinants of labor market outcomes (Heckman et al., 2006). Despite its importance, numerous countries, particularly in low- and middle-income regions, face persistent challenges in elevating math attainment levels. This trend is evident in various international evaluative surveys, such as the Programme for International Student Assessment (PISA), which consistently highlights disparities in math attainment levels across educational systems (see Figure 1).

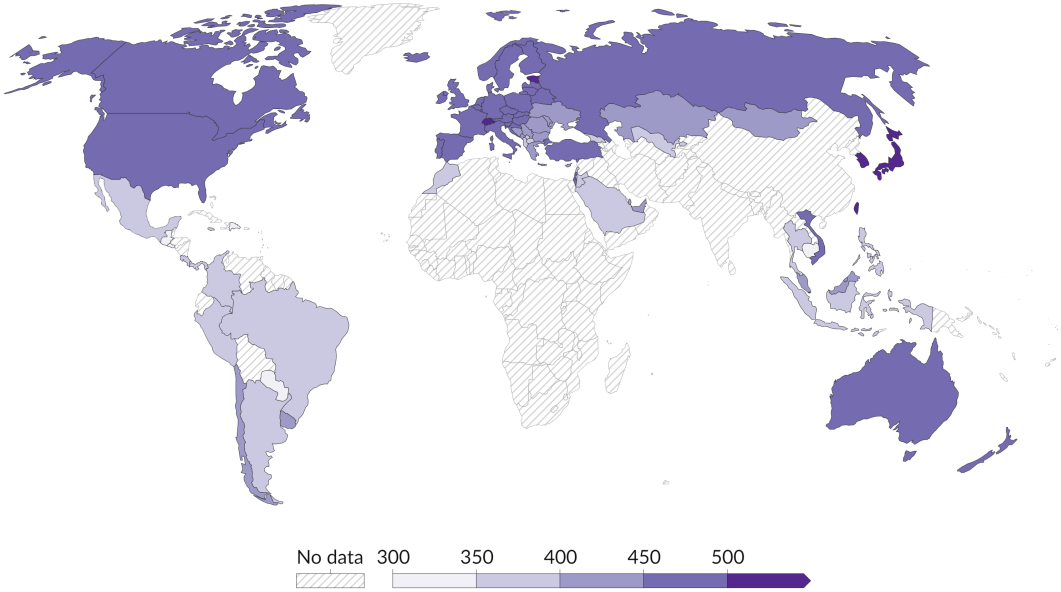
Several factors may contribute to these persistent low attainment levels in mathematics, especially in developing countries. First, learning deficiencies and high retention rates indicate that students often lack foundational skills and are repeatedly held back in their educational progression, which can severely disrupt learning continuity (Jacob and Lefgren, 2009; Manacorda, 2012; Schwerdt and West, 2013) and the resulting in-depth mathematical learning. Second, the perceived low returns to education in some regions deter investment in learning, as students and families may not see clear, direct benefits from educational attainment in terms of improved job prospects or earnings (Hanushek and Woessmann, 2012; Dinkelman and Martínez A, 2014; Acosta et al., 2019). Finally, students often report a lack of meaning and interest[1] toward math studies. Without seeing the practical applications of mathematics in everyday life or future careers, students may lack the intrinsic motivation and engagement needed to succeed in this subject.

The role of motivation in enhancing academic performance in core subjects is well-documented (Howard et al., 2021; Hastings et al., 2012). Intrinsic motivation enhances cognitive engagement and persistence, which are crucial for learning. In mathematics, a subject often perceived as too abstract, applying principles to everyday experiences like financial decisions can make learning more tangible. Examples include using ratios for budgeting, percentages for calculating compound interest, and probability to assess risk, helping students understand math's practical applications. Thus, integrating financial education into math classes may bridge theory and practice, potentially enhancing student engagement. Recognizing this, various countries throughout the world have engaged in national strategies of financial education not only to enhance financial knowledge but also to make math content more relevant to the daily lives of students (OECD/INFE, 2015). Although extensive research exists on the effects of financial education on financial outcomes (see Kaiser and Lusardi (2024) and Kaiser et al. (2022) for a review), none have investigated its potential to enhance student motivation and improve mathematics achievement.

This paper fills this gap by relying on a randomized control trial (RCT) comprising 190 schools and over 15,000 students in Brazil to assess the impacts of a school-based financial education program integrated into the math curriculum on students' attainment, interest in mathematics, and relevant socio-emotional skills. Notably, this is one of the first studies to rigorously explore the potential effects of financial education beyond the strict scope of financial literacy.

[1]For the purposes of this study, the concepts of "interest" and "meaning" in academic studies will be collectively referred to as "intrinsic motivation" or simply "motivation" henceforth. This aggregation acknowledges the intertwined nature of these factors, much like how diverse economic elements interact in learning models (see, for instance, Hastings et al. (2012)). In this sense, motivation, as defined here, also captures the essence of what drives student engagement and perseverance in learning environments. Therefore, the terms "motivation" and "interest" may be used interchangeably throughout this paper.

Figure 1: Average performance of 15-year-olds in mathematics, 2022 (OECD, 2023)



Note: The Programme for International Student Assessment (PISA), administered by the OECD, offers a comprehensive and rigorous international evaluation of the skills and knowledge of 15-year-old students worldwide. The assessment encompasses key areas including mathematics, science, and reading. Originally, the OECD set the average PISA score across all subjects and participating countries at 500, with a standard deviation of 100. Scores in later cycles were calibrated to remain comparable to this baseline.

The financial education program ran for two years (beginning on 2021 and ending on 2022), being administered for six months each academic year and integrating regular mathematics classes. The intervention targeted both teachers and students. First, it provided teachers with pedagogical training in active learning methodologies. This approach holds the potential to render classroom sessions more engaging and comprehensible for students by providing direct and day-to-day applications of the concepts covered in the course. Teachers were supported by a pedagogical guide designed to facilitate the pedagogical transposition of the content. Second, 9th- and 10th-grade students were provided with a textbook that introduced basic financial education concepts as an application of math content. Throughout the course, teachers were instructed to implement the activities using the project-based learning (PBL) methodology.

We collected data in schools across four survey rounds, including a baseline in March 2021, a first follow-up in November 2021 (follow-up 1), a midline collection in March 2022, and another follow-up in November 2022 (follow-up 2). In addition to these surveys, we designed and administered financial literacy and applied math tests at baseline (March 2021) and during the follow-up periods (November 2021 and November 2022). Moreover, we use administrative data from the partnered State Secretary of Education to gather information on students' regular academic performance and math proficiency as measured by the state standardized exam.

Our empirical analysis reveals a complex set of findings. First, we observe positive and sustained effects of the program on financial literacy, as measured by the applied math test. Students from the intervention schools outperformed their peers in control groups by over 0.13 standard deviations (SD) in the first year,

a substantial effect comparable in magnitude to average effects seen in other educational domains, such as reading (Kaiser and Menkhoff, 2020). Although this impact somewhat diminished over time, it remained statistically significant at 0.09 SD one year later. Importantly, our findings indicate that this average effect is predominantly concentrated among students at the lower end of the socioeconomic distribution. By the end of the first round of intervention, we find that the program had positive, heterogeneous impacts on students from poorer socioeconomic backgrounds. One year later, the effect on these students' performance peaked at a statistically significant figure of 0.17 SD, way above the estimated average treatment effect (ATE).

When examining math proficiency as measured by the state's standardized exam, we initially observed a small, positive effect, but statistically indistinguishable from zero. Given that the exam evaluates a wide range of math skills, many extending beyond the scope of the financial education program, we delved deeper by leveraging microdata from the exam. We then find that the program significantly increases students' scores in math skills targeted by the program, and these gains seem diluted when viewed within the context of overall math proficiency as measured by the exam. However, the news is even more encouraging for students from poorer socioeconomic backgrounds. For these students, we observe a significant improvement of 0.15 SD in the overall math proficiency by the end of the first round of the intervention. Additionally, one year later, after two implementation rounds, there was a notable increase of 0.13 SD in their math grades on school report cards.

An additional set of results helps us to interpret the potential mechanisms behind these effects. Specifically, we find that the program's effects on academic performance are accompanied by increased student motivation towards math. Treated students increasingly recognize the value of mathematics in practical aspects, such as assisting their families. Over time, these students start to see mathematics as crucial for achieving their life dreams. A year after the intervention, this belief strengthened, particularly among students from poorer socioeconomic backgrounds, who increasingly view mathematics as one of the most important subjects in their education. Moreover, after two rounds of the program implementation, students from more vulnerable backgrounds show a heightened overall interest in mathematics, as measured by our index of interest in the subject.

Regarding socio-emotional skills, we observe an initial negative impact on students' growth mindset by the end of the first year, an effect that faded in the subsequent period. We interpret this as an initial response to the introduction of new content and methodologies into the math curriculum during a sensitive timing of school reopenings at the end of the most severe period of COVID-19 pandemic[2]. The initially perceived complexity of the content may have led already stressed and anxious students to doubt their abilities to grasp financial concepts, unintentionally reinforcing a fixed mindset. However, this effect disappeared after prolonged program exposure, when students become more familiar with the subject matter over time. On a positive note, we found that treated students improved their decision-

[2]Crispim et al. (2022) show that the COVID-19 pandemic significantly impacted students' socio-emotional skills in the country. Heightened stress and anxiety levels arose from extended isolation and disruptions to regular educational routines, negatively affecting their emotional well-being. Students noted substantial decreases in their ability to plan, organize, and achieve goals. Furthermore, as schools reopened in 2021, issues such as concentration difficulties and struggles with anxiety and insecurity became increasingly evident. This period of enhanced vulnerability likely shaped their responses to the new challenges presented in their education.

making abilities, a crucial soft skill often linked in the literature to readiness for entering the labor market. Extending the analysis for heterogeneous effects on vulnerable students, we find that those enrolled in the program presented an enhanced internal locus of control by the end of the first round of intervention. This finding aligns with their improved academic performance and student intrinsic motivation by the end of the second year, along with the heterogeneous impacts found on soft skills relevant for labor market readiness, notably the ability to solve problems and tolerance to frustration.

We do not find evidence of impacts on self-reported financial behaviors or attitudes, captured by a financial autonomy index developed by Bruhn et al. (2016). While this is in line with the literature, which indicates that behavioral effects are often limited in the short term (Bruhn et al., 2016, 2022; Kaiser et al., 2022), we cannot rule out the possibility that this finding may be influenced by measurement errors, particularly those arising from experimenter demand-effects (EDEs) associated with relying on self-reported behaviors.

All in all, our findings shed light not only on the effects of the program on the main outcomes of interest (math achievement) but also on the underlying mechanisms behind them (student motivation). The study suggests that the program initially boosts students' intrinsic motivation towards math studies and their internal locus of control. This enhancement subsequently leads to improved academic performance and the development of soft skills relevant to the labor market. These effects appear particularly pronounced for students from lower socioeconomic backgrounds, who typically begin at a disadvantage in these areas.

Our paper makes two major contributions to the literature. First, in light of the consistently low performance of students in developing countries and the general lack of school appeal, our paper presents evidence that incorporating more applied content into core subjects can enhance educational outcomes. This finding underscores the potential benefits of curricular integration in addressing broader educational challenges.

Second, it contributes to the literature on financial education programs by providing a more comprehensive and integrated evaluation of the educational impacts of incorporating financial education into the school curriculum for upper-secondary students. As depicted in the next section, much of the literature on financial education concentrates on the effects on financial literacy and behaviors, as shown in the thorough reviews by Kaiser and Lusardi (2024) and Kaiser et al. (2022). While recent studies like those by Alan and Ertac (2018) and Luhrmann et al. (2018) have begun to clarify the impacts on selected socio-emotional dimensions, their scope tends to be narrowly focused on a relatively confined set of dimensions. Our research, however, examines a more exhaustive set of skills. This provides a richer analysis of the interplay between these effects, academic outcomes, and students' intrinsic motivation.

The paper proceeds as follows. Section 2 presents the related literature, the Brazilian educational context, and the program's features. Section 3 explores the experimental design, covering the study's timeline, sampling and randomization procedures, and its empirical strategy. Section 4 describes the survey instruments and administrative data used and provides insights into baseline statistics, as well as take-up and attrition rates. Section 5 presents the main findings of the study. Finally, Section 6 offers conclusions and discusses the implications of the results.

2 Background

2.1 Financial education literature

In the past decades, several countries around the world have developed and implemented national financial education strategies (OECD/INFE, 2015; OECD, 2023), a movement that gained momentum following the 2008 financial crisis. Since adult participation in financial education workshops is typically low (Bruhn et al., 2014), there has been a strategic shift toward focusing on younger demographics. The rationale for adopting a school-based approach is compelling, with advocates emphasizing that such programs harness the learning capacities of students and instill good financial behaviors and habits at an early stage, as argued by Lusardi et al. (2010), Bruhn et al. (2016), Brown et al. (2016), and Frisancho (2023). These early-formed financial attitudes and habits can prove advantageous, contributing positively to educational attainment and employment prospects in adulthood (Bruhn et al., 2022).

Additionally, recent studies suggest that these programs have the potential to foster patience and the ability to delay gratification (Alan and Ertac, 2018; Luhrmann et al., 2018), traits identified as important determinants of academic and socioeconomic outcomes (Mischel et al., 1989; Duckworth and Seligman, 2005; Sutter et al., 2013). In contrast, there are concerns that the inclusion of new content in students' curriculum could harm their academic performance in core subjects or that the focus on financial topics might encourage them to value work over studies, even leading to school dropout.

Bjorvatn et al. (2020), in fact, find negative treatment effects of a youth entrepreneurship program in Tanzania on student achievement and retention. Bruhn et al. (2016) and Frisancho (2020), assessing the impacts of school-based financial education programs in Brazil and Peru, respectively, find that treated students are indeed more likely to work, but this does not seem to affect their academic performance. While the literature on the impacts of these programs on financial knowledge and behavior has grown at a surprising pace in recent years (Kaiser and Menkhoff, 2020), the exploration of the effects of school-based financial education on relevant academic dimensions such as socio-emotional skills, linked math-skills attainment, and student motivation and interest in related subjects is still sparse. This highlights the need for further research in the area, especially considering the low math attainment and interest in middle and low-income countries and the advance of a policy agenda for financial education for youth.

More closely related to our study in context and curriculum, the aforementioned studies from Bruhn et al. (2016) and Frisancho (2020) look at students' graduation and passing rates and their school transcript grades. However, these studies focus on evaluating potential substitution effects and do not delve into broad educational impacts and mechanisms behind incorporating financial education into the school curriculum. It is worth mentioning that just a few papers have investigated the impacts of financial education for youth on socio-emotional skills. Those who investigated focused mainly on patience and intertemporal decisions.

In an interesting experiment in Turkey, Alan and Ertac (2018) find that children who were exposed to a school program that encourages forward-looking behavior, with a focus on saving habits, made significantly more patient inter-temporal choices in time preference elicitation tasks, a result that was persistent even three years later. Moreover, a striking finding was that even one year after the intervention, treated students were about 10 percentage points less likely to receive a low "behavior mark" in the school record,

suggesting impacts on self-control. Luhrmann et al. (2018) find results in the same manner for a financial education program in German high schools, with treated students making more time-consistent choices.

Going further into the socio-emotional channels, Frisancho (2020) investigates the impacts of a school-based program in Peru on students' self-control, finding positive effects of the magnitude of 3% SD. These findings suggest that, indeed, a curriculum focusing on forward-looking behaviors and an analytical approach to the future has the potential to foster relevant socio-emotional skills, notably those related to planning and the learning experience.

Therefore, we leverage rich survey data to assess the effects of the "Learning to Deal with Money" program on related soft skills that are also relevant for academic success and still malleable at the targeted age group. Heckman et al. (2006) highlight the importance of a more developed internal locus of control for future academic and labor outcomes, and Botha and Dahmann (2024) shows that this trait is still being developed in teenage years. The same applies to grit (Alan et al., 2019; Hoeschler et al., 2018) and a growth mindset (Yeager and Walton, 2011; Yeager et al., 2016). Taking this socio-emotional literature into account and the lack of such investigation on financial education research, we provide a more comprehensive and integrated evaluation of the educational impacts of school-based financial education programs.

2.2 Brazilian context

Brazil exemplifies the complex challenges that developing countries face in mathematics education. With high retention and dropout rates, the country struggles with low student engagement for various reasons - from poor educational service quality to services that do not meet the needs of the youth (Barros et al., 2017). Notably, Brazilian students experience more anxiety in math classes than 67% of students in OECD countries (PISA, 2012). While the reasons behind this are multifaceted and extensively discussed in the literature, studies have pointed out that the perceived lack of meaning in school curricula is a major contributing factor (Barros et al., 2017; Soares et al., 2015; da Gama Torres et al., 2013).

In response, several policies have been rolled out to make school more appealing to youth. The 2017 High School Reform, despite various design and implementation issues, aimed to address these problems by increasing student workload, establishing a common curriculum framework, and enhancing student choice. Additionally, the 2018 reform of the National Core Curriculum (*Base Nacional Comum Curricular*, in Portuguese, BNCC) unified state curricula and provided guidelines for more attractive and engaging classes. For instance, the BNCC guidelines emphasize that schools should connect mathematical learning to students' daily lives by stating that "in high school, the focus is on building an integrated view of Mathematics, applied to reality [...]. In this context, when reality is the reference, it is essential to consider the daily experiences of high school students, who are affected - to varying degrees depending on their socioeconomic conditions - by technological advancements, labor market demands, social media, among other factors". Importantly, the document explicitly recommends integrating school-based financial education into the curriculum as a strategy to spark students' interest in mathematics and, ultimately, improve their proficiency in the subject[3].

[3]The BNCC guidelines for the mathematics curriculum of primary and lower secondary education state that "[a]nother aspect to consider [...] is the study of basic concepts of economics and finance, aiming at the financial education of students. These

In the current Brazilian context, and similarly in other middle-income economies, this type of initiative may come in handy not only within school settings but also beyond them. Partly due to the educational challenges described above, such economies commonly exhibit low levels of financial literacy (Mo, 2020), which likely contribute to unwarranted issues such as high indebtedness, low savings rates, a sizeable informal credit system, steep interest payments, inadequate budget planning, and a strong tendency toward present bias (OECD, 2023). This pattern was recently reinforced by policy reports such as OECD (2023) and those of the Central Bank of Brazil (BCB, 2023), which consistently point out that while Brazilians perform well in some aspects — such as diligent financial monitoring, proactive information seeking when selecting financial products and services, and a high rate of bank account ownership — there are critical areas of concern. These include low resilience to financial shocks, a low tendency to invest when this is possible, and poor levels of financial knowledge[4].

2.3 The program

In 2019, the Secretary of Education of the state of Goiás, Brazil, initiated the "Learning to Deal with Money" program through a collaboration with the BEI Institute. This initiative aimed to integrate financial education into the 9th- and 10th-grade curricula using active teaching-learning methodologies.

The primary objective was encouraging students to engage in autonomous and participatory learning by addressing real-life problems and situations. The program was designed in accordance to the BNCC guidelines and sought to address the challenges of introducing financial education in schools. The pedagogical approach was centered around project-based learning (PBL) methodologies, incorporating diagnostic tools, participatory planning, application, and evaluation.

Treatment was twofold. First, it provided students and teachers with pedagogical materials: a student textbook and a teacher's pedagogical guide. The student textbook offered practical financial education by working on students' math skills through everyday problems in simple contexts and exercises. The teacher's pedagogical guide provided a step-by-step method for developing and implementing the PBL methodology within a class, with tools designed to engage students in creating collective projects. Second, treated teachers were provided in-service training on active learning methodologies[5]. This approach holds the potential to render classroom sessions more engaging and comprehensible for students by providing direct and day-to-day applications of the concepts covered in the course.

Besides working on math-related hard skills, the program works on forward-looking behaviors and attitudes, having the potential to foster key socio-emotional skills such as a growth mindset, internal locus of control, and grit, attributes are related to personal resilience and perseverance (Rotter, 1966; Dweck, 2006; Duckworth and Seligman, 2005)[6]. The program leverages the application of real-life problems to teach

issues, in addition to promoting the development of personal and social skills among students, can provide excellent contexts for the application of Financial Mathematics concepts, as well as offer opportunities to expand and deepen these concepts".

[4]The report of the Central Bank of Brazil states that "results [...] indicate the need to address various aspects of financial education, intending to support the improvement of the population's financial well-being" (BCB, 2023).

[5]Section 4 provides more information on implementation and take-up.

[6]Growth mindset, as proposed by Dweck (2006), is the extent to which students believe that they can get smarter through effort (as opposed to a fixed mindset). Also, Rotter (1966) defines an internal locus of control as the degree to which people believe that they have control over the outcome of events in their lives, as opposed to external forces. Finally, grit may be

mathematical concepts, encouraging students to engage with everyday challenges and decisions. Such an approach helps students recognize the relevance of their learning and encourages a growth mindset — the belief that their abilities can improve with effort and practice (Dweck, 2006). Additionally, the focus on forward-looking attitudes, such as planning and analytical decision-making processes, has the potential to foster an internal locus of control and grit (for more on the potential impacts on socio-emotional skills of financial education, check Section 2.2).

By demonstrating the real-world implications of academic knowledge and highlighting how it equips students to effectively manage the consequences of their decisions, the program seeks to motivate students to confront challenges and persevere through difficulties. This approach is designed to enhance students' engagement with their learning process, fostering resilience and a proactive attitude toward overcoming obstacles.

The program "Learning to Deal with Money" also targets the development of both hard and soft skills among students from particularly impoverished socioeconomic backgrounds. This focus is critical not only because of the well-documented educational challenges among these students but also because they frequently come from families engaged in self-employment and micro-entrepreneurship. For these individuals, the program's content may be particularly pertinent and potentially more engaging as it directly relates to their everyday economic environments and challenges. By aligning the educational material with the real-world financial scenarios these students are likely to encounter, the program potentially enhances the relevance and practical application of the school curriculum, increasing student interest and participation in their own educational process[7].

The intervention was also characterized by a collaborative network involving various stakeholders from governmental and non-governmental sectors, sharing responsibilities at each implementation stage. Implementation required coordination among high-level officers from the State Secretary of Education, superintendents of education, regional managers, and the teacher training center. At the school level, pedagogical tutors[8], school managers (principals and pedagogical coordinators), and mathematics teachers were involved so as to the program to achieve its goals.

seen as a combination of passion and perseverance towards long-term goals (Duckworth et al., 2007).

[7]This perception is corroborated by the findings of Bruhn et al. (2016), who documented the spillover of financial knowledge to families resulting from a school-based program implemented in Brazilian schools between 2010 and 2011. Similarly, Foley et al. (2014) demonstrated how a parent's positive valuation of education significantly influences a student's decision to either persist with their studies or drop out.

[8]In the state of Goiás, Brazil, pedagogical tutors are educators who oversee pedagogical activities within a regional administration for a designated group of schools. Their responsibilities include planning with coordinators and managers, monitoring, advising, evaluating, and providing feedback on the operational aspects of educational work. This encompasses developing lesson plans, managing annual planning, maintaining records in teachers' diaries, offering feedback on plans, and supervising the teaching methodologies implemented by teachers.

3 Research Design

3.1 Intervention Outline

In 2019, in partnership with the Secretary of Education of Goiás, the intervention was implemented in a pilot version in 85 public schools of the state. In 2020, due to the restrictions imposed by the outbreak of the new coronavirus pandemic and the closure of schools in the country, the program was adopted in a reduced and remote format, only for teachers, in the same schools as the pilot.

In 2021, as vaccination efforts progressed and in-person classes were anticipated to resume, the program was fully implemented in a new cohort of public schools, distinct from the schools involved in the initial pilot. This rollout included the pedagogical training for mathematics teachers and a six-month course for 9th-grade students. This setup allowed for an experimental impact evaluation, designed to rigorously assess the causal effects of the intervention across cognitive, socio-emotional, and behavioral dimensions through a randomized controlled trial. To minimize the risk of spillover effects, the program was assigned at the school level (Glennerster and Takavarasha, 2014). The following subsections provide detailed explanations of the sampling methods and randomization techniques employed.

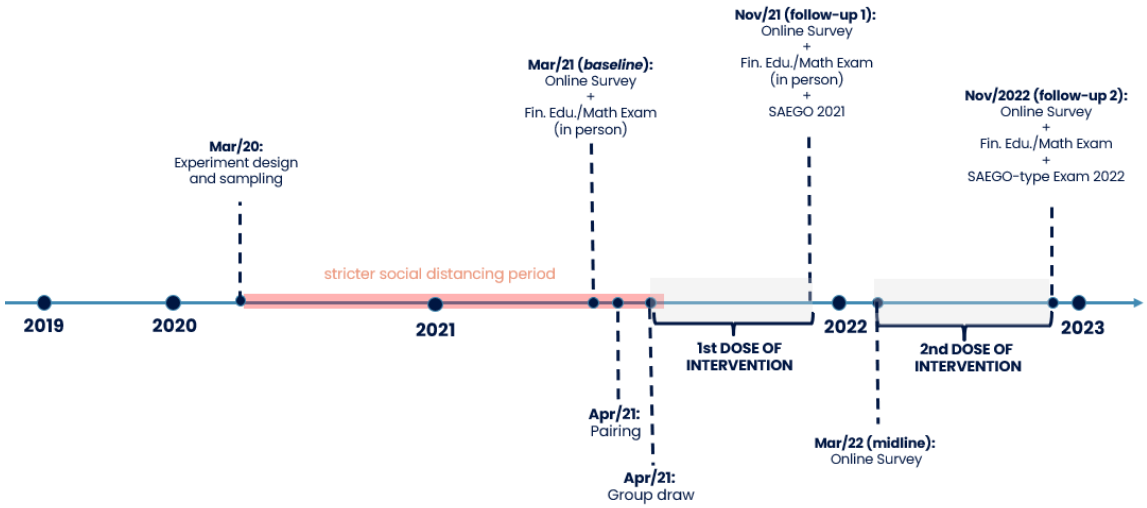
The implementation of the program in classrooms began in May 2021, after schools were drawn and at the end of teachers' training. In that year, classes in Goiás were resumed in a hybrid format in the first academic semester (February to June) and in person in the second (August to November). Thus, the baseline questionnaire for students was administered remotely in March 2021, before the draw, a strategy that allowed greater engagement of the control group and the use of baseline data in school pairing. As the remote administration of the survey was successful and had a high response rate, the follow-up questionnaire was also applied remotely in November of that year. By the time these questionnaires were administered, students were also invited to take a financial literacy and applied math exam in person at schools.

In 2022, with the goal of deepening the understanding of the impacts of the intervention, especially in a context of return to normality in schools, a new dose of the program was administered in the treatment schools of 2021, now for students in the 10th grade (first year of high school in Brazil). Thus, treated students who continued in the same school (or moved to another treatment school) in 2022 received a second exposure to the program, adapted to the 10th-grade mathematics curriculum. It is worth noting that teachers in high school are, in general, different than those in the 9th grade. Hence, the second dose of the treatment is targeted at students and not necessarily at teachers. With the maintenance of the experimental design, we sought to follow students over time, evaluating the effects of a continuous financial education program and whether initial effects are sustained over time.

Data collection in 2022 followed the same design as the previous year, with the surveys being administered online in March and November and the mathematics and financial literacy exams being applied in person at schools during the same months. Most of the outcomes, presented in Section 4, were surveyed in the two follow-ups and the midline collection, except for a questionnaire on skills for the labor market, recently developed by the Laboratory for Studies and Research in Education and Social Economy from the University of São Paulo (LEPES-USP), which was designed for students in high school and, hence,

applied only in the 2022 collections. In addition, the financial literacy and applied math exams measure competencies developed in the corresponding year. Section 4 presents more details on the instruments and the figure below summarizes the timeline briefly described here.

Figure 2: Study Timeline



Elaborated by the authors.

3.2 Sample Selection

The study sample, comprising 190 public schools in Goiás, was chosen through a stratified draw. Schools were randomly selected from groups of similar units (strata), ensuring a diverse and representative sample of the state for our study.

In the Goiás educational system, schools can offer either only high school or upper-primary and secondary education, when they are known as hybrid schools. Due to our goal of evaluating the intervention's impacts on young people initiating their financial decisions and transitioning to high school, the program was offered only to hybrid schools. By the beginning of 2021, 432 hybrid schools had not participated in the pilot version of the intervention, making up our target population.

We divided these 432 schools into 127 groups of similar characteristics, defined according to the following approach. For each of the 40 regions of the Goiás educational system, smaller groups of schools were defined according to the performance in mathematics of their 9th-grade students in the last state standardized exam (SAEGO) available. For larger regional areas, schools were divided into quartiles of that region's mathematics score distribution. In their turn, smaller areas were either divided into two strata (according to the median math score) or not divided at all (when there were only four or fewer hybrid schools in the region). We opted for this approach as the program is designed to be implemented into the mathematics curriculum, and based on the fair representativeness results found.

Once strata were defined, we conducted some tests to ensure the selection by a stratified draw would result in a representative sample of the state's system. This assessment was based on distribution analyses

and Kolmogorov-Smirnov tests of the following dimensions: schools' scores in mathematics and Portuguese in the 2018 and 2019 state exams (SAEGO); performance of the schools in the National Assessment of Education (IDEB) of 2015 and 2017; and the total enrollment in the schools and their 9th-grade. Appendix A.1 details the representativeness tests.

The sampling was then based on generating a random number for each school and selecting those within each stratum up to the 47th percentile. Due to the shift of some schools to a full-time curriculum, which was not eligible to receive the program, and the closure of the 9th-grade on other participants, our first sample of 200 schools was reduced to 190, with no significant loss of statistical power [9].

3.3 Pairwise Randomization

The program allocation among schools used pairwise randomization through a public draw [10]. For this purpose, upon completing the baseline survey, its data was processed and used to divide the sample into pairs of similar schools. This approach was chosen to mitigate the risk of imbalances in relevant dimensions between treatment and control groups.

We tested three school matching approaches in terms of their probability of registering imbalances in groups of relevant school-level variables, notably those related to i) the selection of respondents, such as the percentage of students with access to the internet and of completed surveys; ii) the performance of students, with variables accounting for their scores on cognitive and socioemotional outcomes; and iii) faculty engagement and performance on financial literacy competencies. For each of the proposed pair-matching approaches, we simulated one hundred randomizations. Then, for each resulting draw, a dummy for the assigned group was regressed on the aforementioned sets of variables. Testing the significance of these groups allowed an assessment of potential selection problems in the pairing strategies. Appendix A.2 details the variables used and the approaches tested.

The chosen pair-matching recorded the slightest imbalance in the set of variables related to selection. It consists of building three principal factors [11], one for each of the sets of variables mentioned, and then aggregating the three factors into a single principal factor. Schools were then paired according to their proximity in terms of this main factor. Finally, the randomization was publicly streamed and involved 96 sequential draws: one for each pair of schools, allocating them to Group A or B, and a final draw assigning treatment to one of these two groups.

3.4 Empirical Strategy

Based on the random assignment, the impact of the program on the different students' outcomes is measured as the difference in averages in treatment and control groups, using the following intention-to-treat (ITT) OLS regression:

[9] Our first sample was of 201 schools and due to the grade reorganization in schools, a new sample of 200 was selected. Appendix A.1 also details this process.
[10] It was broadcast live on the YouTube channel of the Goiás Secretary of Education on April 27, 2021.
[11] Using Principal Component Analysis.

$$y^f_{isp} = \alpha + \beta \cdot Treatment_s + \lambda y^b_i + \gamma_p + \mathbf{X}'_i \cdot \boldsymbol{\delta} + \epsilon_{isp}$$

Here, y^f_{isp} denotes the outcome of interest of student i in school s of matched-pair p in the follow-up survey f. The impact of the treatment is given by β, the coefficient associated with the dummy variable $Treatment_s$. This variable indicates school-level random treatment assignment within each matched-pair p, where it is set to one when the school s is in the treatment group and zero otherwise.

The main specification includes y^b_i, corresponding to the baseline value of the outcome variable, whenever it is available. This inclusion follows McKenzie (2012), according to which an analysis of covariance (ANCOVA) in the estimation considerably improves the statistical power. Additionally, the specification includes a set of dummy variables γ_p to account for matched-pair fixed effects and a vector of individual-level baseline characteristics, $\mathbf{X}_i$.

While the experimental design does not necessitate the inclusion of covariates — given that random assignment and baseline balance already ensure an unbiased estimate of the ATE — we chose to incorporate baseline individual control variables in our main specification to enhance the precision of the estimates. The selection of covariates followed a machine learning approach to variable selection, specifically the post-lasso regression of Belloni et al. (2014). This method was particularly useful given the extensive number of variables collected at baseline, helping us avoid *ad hoc* choices of controls. In addition to the lasso-selected variables, we also included those that exhibited some imbalance between the treatment and control groups at baseline[12]. To further validate our findings, we conducted robustness checks to examine the impact of excluding certain controls. These checks are detailed in the Results section and the Appendix.

For outcomes that are part of a family of items (facets of a construct), the Romano-Wolf correction was implemented, aiming to correct for the familywise error rate (FWER) when testing for multiple hypotheses simultaneously (Romano and Wolf, 2005). Also, standard errors were clustered at the school-pair level, following De Chaisemartin and Ramirez-Cuellar (2024).

Finally, the analysis of heterogeneous treatment effects, particularly those examining differential impacts on students from poor academic backgrounds in Section 5, employs the following OLS regression model:

$$y^f isp = \alpha + \beta \cdot Treatment_s + \eta \cdot x_i + \theta \cdot Treatment_s \times x_i + \lambda y^b i + \gamma p + \mathbf{X} i' \cdot \boldsymbol{\delta} + \epsilon isp$$

In this model, x_i represents the baseline characteristic of interest for the heterogeneity analysis. This specification mirrors the previous one, with the addition of the interaction term, $Treatment_s \times x^b_i$. The coefficient θ thus captures the heterogeneous impacts, quantifying the differential effects of the treatment contingent on the baseline characteristics represented by x_i.

[12]Despite the robustness of random assignment in the experimental design, baseline imbalances between treatment and control groups can still occur purely by chance. This is because randomization guarantees equality on average across many trials, but not necessarily within each individual trial. When numerous covariates are involved, these imbalances may become statistically significant at conventional significance levels. For example, assume that we had 100 different variables to test for differences between control and treatment groups. At a 10% significance level, one could expect that at most 10 of them would show an imbalance by chance alone.

4 Data and Measurement

4.1 Survey and Administrative Data

Our research relies mostly on primary data from baseline and follow-up collections, assessing students' engagement with school and with mathematics classes, their socio-emotional development, and performance in specific tests of mathematics and financial literacy skills covered by the program. The engagement and socio-emotional skills questionnaires were applied remotely in the baseline collection of March 2021 and in the follow-ups of November 2021, March 2022, and November 2022 [13]. We opted for the remote application due to the high adherence rate recorded in the first collection, amid the severest period of the COVID-19 pandemic when this was the only option, and its lower costs. The questionnaires could be answered within a week and be paused. They were applied through the official system of the Secretary of Education, which requires student ID authentication, allowing students to be more comfortable answering them honestly.

In their turn, the specific math skills and financial literacy exams were administered during the same months in person in the classrooms as a regular school test, proctored by a teacher and observing public health and anonymity protocols. In addition to our collections, we use administrative data from the Secretary of Education on students' transcript grades from 2020 to 2022, and their performance in the state standardized exam (SAEGO) — the official assessment of competencies in mathematics and Portuguese literacy applied at the end of each school cycle (5th-grade, 9th-grade and 12th-grade).

The baseline survey contained questions on the investigated outcomes and students' socioeconomic and academic backgrounds, race, gender, and socio-emotional characteristics related to the main outcomes. These relevant variables are used in the post-lasso selection of controls and in assessing the heterogeneity of the treatment in terms of socioeconomic background. Our outcomes of interest can be seen in five big dimensions: math attainment, students' motivation and interest in mathematics, socio-emotional skills, skills for the labor market, and financial education outcomes. Below, we provide more details on the variables considered in each dimension.

4.1.1 *Mathematics Attainment*

In this group of outcomes, we look at the program's effects on objective measures of mathmatics attainment. We evaluate the grades teachers gave at the end of the academic years and the standardized grades obtained by students on the state exam, SAEGO. The latter analysis has the advantage of allowing students' performance to be assessed without the potential bias of teachers from treated schools increasing the grades, aiming to show a good performance to the school management or evaluators. Furthermore, as SAEGO allows the identification of the mathematics skills assessed in each question, we can evaluate the program's impact on the sets of competencies covered or not by the book, allowing an assessment of potential substitution effects.

As SAEGO is applied only to 5th, 9th, and 12th-grade students, we do not have this measure at the end of the program's second year. To have a better understanding of the academic effects of the intervention, which as previously discussed is the main goal of the program, the BEI Institute partnered

[13] For more information on the timeline, refer to the Experimental Design section.

with the *Centro de Políticas Públicas e Avaliação da Educação* (CAEd/UFJF), a local education research and survey institute with extensive experience in designing standardized exams to be administered in schools, to provide a test in the lines of SAEGO for application in the first year of high school (10th-grade) in the participants of the study (control and treatment schools). With this, we have a proxy of the student's performance in a standardized test comprising the items to be worked on in mathematics in the 10th grade.

4.1.2 *Interest and Motivation*

The program aims to make mathematics content and school more attractive to young people and more applicable to their everyday lives. Therefore, we include blocks of questions measuring students' interest in mathematics, their perception about study strategies, and their desire to follow the studies.

Whereas the desire to continue studying is measured by a dummy indicating whether the student would finish high school if this depended only on his/her decision, the interest in math and the dedication to the subject are measured by two blocks of questions that assess these aspects. For the first dimension, we asked students how much they agree with seven statements about the importance of mathematics in their lives, such as *"What I learn in Mathematics at school is important for me to fulfill my dreams"*, *"What I learn in Mathematics at school is important for me to help my family"*, *"Only students who like math should take those classes at school"*, and others [14]. For the second dimension, we asked students how important they believe it is for their math performance to practice exercises, pay attention to classes, study in groups, and plan studying time. We evaluate the program's impacts on two factors [15], summarizing these dimensions and the students' agreement level for each individual item.

4.1.3 *Socio-Emotional Skills*

We evaluate three socio-emotional skills appointed by the literature as relevant to academic performance and that are still malleable in adolescence: growth mindset (Dweck, 2006; Claro et al., 2016; Yeager and Walton, 2011; Yeager et al., 2016), locus of control (Heckman et al., 2006; Botha and Dahmann, 2024), and grit (Duckworth et al., 2007; Hoeschler et al., 2018; Alan et al., 2019).

We use validated questionnaires from the psychology literature to assess these dimensions. Notably, to measure growth mindset, which can be understood as the belief that one holds about his or her ability to develop certain skills over time, we use an adaptation to the Brazilian context of the questionnaire developed by Dweck (2006). For grit, which is the perseverance towards a set goal, we use a translation from Duckworth et al. (2007) scale, and for the internal or inner locus of control, which is the belief on holds that the outcomes of their lives are results of their own actions or abilities, we use a well-established scale of Rotter (1966).

In addition to these instruments, partnering with the Ayrton Senna Institute [16], we use a socio-emotional survey already validated in public schools of Brazil (Primi et al., 2016, 2021) to control for

[14] The other referred statements are: *"What I learn in Mathematics at school interests me"*, *"I consider Mathematics to be one of the most important things that school teaches"*, *"What I learn in Mathematics at school is not important for my daily life"*, and *"What I learn in Mathematics helps me to learn other subjects at school"*

[15] Generated by Principal Component Analysis.

[16] The Institute has the legal rights of the SENNA, the national socio-emotional assessment instrument.

personality traits, more crystallized at this stage of life, and that could influence the academic outcomes and the investigated socio-emotional skills, notably self-management and negative-emotion regulation.

4.1.4 *Readiness for the Labor Market*

For the second year of the program, we also applied in our surveys an instrument developed by the Laboratory for Studies and Research in Education and Social Economy from the University of São Paulo (LEPES-USP) to assess how prepared high school students are for the transition to the labor market, taking into account skills valued by potential employers as well as in future academic endeavors. This questionnaire has been applied in public and private schools in the country to generate information about the shortage and mismatch of skills among the young population.

From the large set of competencies assessed by the complete questionnaire, we restrict our analysis to seven skills that we believe could be affected by the program, through the stimuli to forward-looking mentality and behaviors. Those are: i) ability to make decisions, ii) ability to prioritize tasks, iii) ability to solve problems, iv) responsibility and commitment, v) frustration tolerance, vi) learning to learn, and vii) planning a career in line with a life project. The questionnaire only applies to high school students, thus, it was administered only for the 10th grade (2022).

4.1.5 *Financial Literacy*

Our assessment of basic financial literacy concepts (such as simple and compound interest rates, risk diversification, and inflation) and program-specific mathematics skills was based on in-person exams applied in the classrooms. These tests include questions adapted from different sources, such as the PISA Financial Literacy (OECD), stylized questions from the financial literacy literature (Lusardi and Mitchell, 2011), and math-specific items prepared by a pedagogical consultant not directly involved in the program. Although the exact questions varied between collections[17], they covered the same skills and were designed to maintain the same level of difficulty.

To evaluate the program's impacts on the financial behaviors and attitudes of these young, who are still not very financially active, we based our assessment on taking into account other financial education interventions for the same age group. Notably, we use questions from the financial autonomy index developed by Bruhn et al. (2016) in partnership with the previously mentioned CAEd/UFJF [18]. According to Bruhn et al. (2016), the index measures whether students feel empowered, confident, and capable of making independent financial decisions. As for other comprehensive sets of questions, we use a principal component analysis to create an index summarizing the investigated dimension.

4.2 Baseline Summary Statistics

At the baseline, all our sampled schools administered the remote survey and in-person exam to their students. Considering the individuals for whom we have information on all the relevant baseline variables,

[17] It is worth mentioning that the baseline test was not as extensive as the follow-up, not including, for instance, PISA-OECD questions.

[18] *Centro de Políticas Públicas e Avaliação da Educação*, from Federal University of Juiz de Fora

notably the pre-intervention values of the outcomes, as well as administrative and survey data to control for students' academic and socioeconomic background, we have a sample of 6,522 students: 3,275 in treated schools (50.2%) and 3,247 in the control (49.8%).

The table below shows the groups are fairly balanced, with no statistically significant differences in most pre-treatment and control variables. The only exceptions are the index for negative-emotion resilience (from the big five socio-emotional survey, Senna), with a slightly better performance in the control group, and the growth mindset index, on the contrary, higher in the treatment group. There are no relevant differences in other baseline values of the results.

Table 1: Baseline Statistics and Balance

	Control	Treatment	Diff. (T-C)	p-value
Panel A: Background characteristics				
Age	14.96	14.99	0.03	0.54
Male	0.45	0.45	0.00	0.96
White	0.29	0.28	-0.01	0.34
Socioeconomic Index (index, pca)	0.12	0.09	-0.03	0.37
Panel B: Educational controls				
Always studied in public school	0.73	0.69	-0.04	0.92
Never failed a grade	0.88	0.86	-0.02	0.70
Afternoon shift	0.54	0.57	0.03	0.64
Self-management (Senna index)	-0.07	-0.15	-0.07	0.38
Negative-emotion resilience (Senna index)	-0.41	-0.50	-0.09*	0.05
Panel C: Baseline educational outcomes				
Math Grade in 2020	7.48	7.36	-0.13	0.22
Desires to finish high-school	0.96	0.94	-0.02	0.12
Study strategy in math (index, pca)	-0.05	-0.00	0.05	0.16
Engagement in math (index, pca)	-0.01	0.03	0.03	0.20
Panel D: Baseline socioemotional outcomes				
Growth mindset (index, pca)	-0.03	0.00	0.03*	0.07
Grit (index, pca)	0.08	-0.01	-0.09	0.18
Inner locus of control (index, pca)	0.70	0.69	-0.01	0.26
Panel E: Baseline financial educ. outcomes				
Financial literacy test score (perc.)	0.63	0.63	0.00	0.60
Financial Behavior (index, pca)	0.02	-0.04	-0.06	0.45

Note: The table presents the groups' means, the difference between them, and the respective p-values. Significance levels (*10%; **5%; ***1%) are captured through OLS estimation considering school pairs fixed effects and accounting for clustered (school pairs) standard errors. F-test of joint significance: 1.299, not statistically significant. Panels A and B comprise the control variables to be explored to increase the precision of the estimates, measuring characteristics related to the socioeconomic and academic background of the students. Panel C shows the baseline values for the outcomes of mathematics attainment and engagement (SAEGO is only applied at the end of the 9th grade and is therefore not available). Panel D brings the baseline values of the socio-emotional dimensions investigated, and Panel E the financial education baseline variables. Note that dimensions measured by a set of questions are assessed through indices generated by principal component analysis (pca).

4.3 Implementation, Take-up and Attrition

The program's implementation faced various challenges and required consistent coordination, particularly in the first year of the intervention due to the restrictions and uncertainty caused by the COVID-19 pandemic. Yet, the program successfully navigated these circumstances through diligent planning and flexible adaptability.

A robust daily monitoring was established between the BEI Institute and the regional offices of the Goiás Secretary of Education during the baseline and follow-up periods (March and November of each year), a strategy that allowed for efficient and successful data collection, even in the online format and with the mobilization of control schools still in the follow-ups. The online surveys counted on a secure ID authentication process using administrative data and the Secretary's internal system, which helped ensure data integrity and protect the privacy of the respondents.

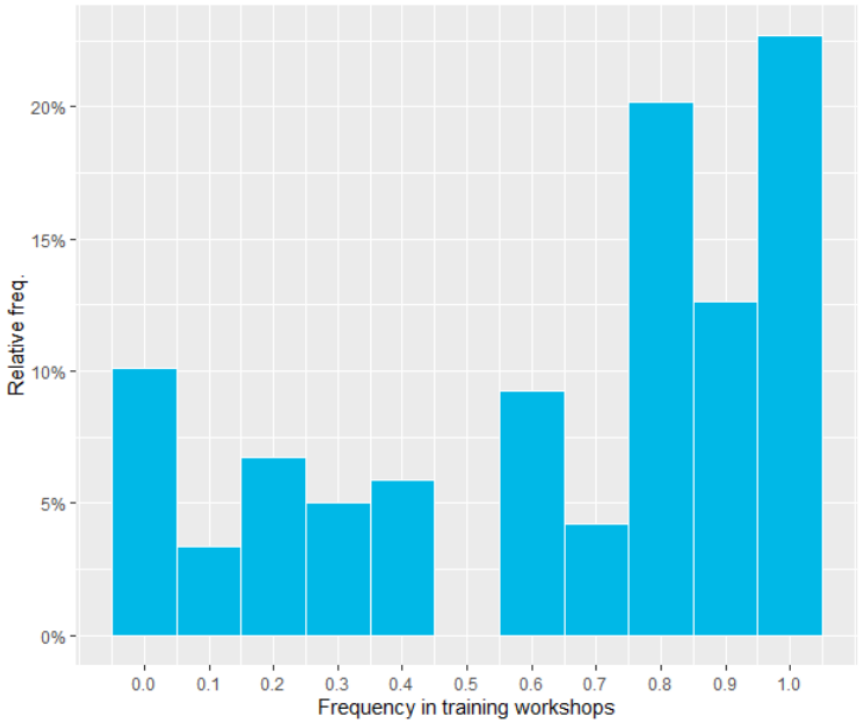
Additionally, a monitoring routine between the Institute and the Secretary allowed an assessment of the program's implementation and progression, helping to address any emerging issues and keeping all involved parties informed about the project's status and the experiment's integrity. To minimize potential confounding effects, third-party programs in the Goiás educational system were thoroughly monitored. This vigilance ensured that other initiatives did not interfere with our sample, thereby maintaining the validity and reliability of the study's results.

The program was delivered to students in the classrooms during regular school hours. Hence, the take-up rate has to be inferred from teachers' attendance at the pedagogical workshops. The distribution of teachers' frequency in the workshops is presented below in Figure 3. One can see that the take-up was not complete but relatively high, with a median participation rate of 77.8%.

Even with the broad set of dimensions and data sources used, participant attrition does not seem to be a severe problem for our study. Note that we have five sets of data for each year of the intervention, namely: the online questionnaires, the financial education and applied math exam, the transcript grades, the SAEGO scores, and the questionnaire on skills for the labor market [19]. Thus, we compute attrition rates for each of the mentioned sets and, even considering these ten rates, which vary between 4% (the case of SAEGO) and 33% (2022 skills questionnaire), we do not have evidence of differential attrition.

[19] This was only applied in March and November of 2022 as was applicable just to the 10th grade. Therefore, the impact of the first year of the intervention on these skills is measured by the differences in students' skills at the beginning of the following academic year, before the second dose of the program was administered.

Figure 3: Frequency in teachers workshops



Note: elaborated by the authors.

Table 2 presents the percentage of non-attritors for each data source, considering the initial sample of 6,522 observations from the baseline. As one can see, there is no statistically significant difference between treatment and control groups, suggesting that the treatment exposure did not affect enrollment and surveys participation rates.

In addition, we checked the baseline balance of non-attritors on the referred variables in the previous subsection, namely the pre-treatment values of the outcomes and the socioeconomic and academic background variables. The balance tables for the non-attritors on each of the ten data sources are presented in the Appendix. For the data concerning the first-year effects of the intervention, we observe a similar balance to the one with the whole sample (Table 1), without an overall imbalance between treatment and control groups. For the non-attritors of the second-year datasets, we observe some statistically significant imbalances between the groups, which we believe do not affect our estimations as we use the baseline values of most of the outcomes and other controls selected by a machine-learning approach (post-lasso selection. Belloni et al. (2014)).

Table 2: Share of Non-Attritors, by dataset and treatment assignment

	Control Mean	β	[SE]	p-value
Non-attritors 2021				
Survey	0.81	0.03	0.047	0.48
Fin. Edu. Exam	0.90	0.02	0.016	0.25
Math Grade	0.73	0.02	0.067	0.81
SAEGO Exam	0.96	0.01	0.009	0.25
LM Skills Survey	0.70	0.02	0.038	0.65
Non-attritors 2022				
Survey	0.66	0.00	0.035	0.99
Fin. Edu. Exam	0.68	0.03	0.033	0.40
Math Grade	0.76	0.01	0.029	0.74
SAEGO-type Exam	0.68	0.03	0.033	0.39
LM Skills Survey	0.67	0.00	0.035	0.94

Note: The table presents the share of non-attritors in the control group by follow-up datasets, as well as the difference relative to the treatment group, captured by an OLS estimation of the non-attrition dummy on the treatment assignment and the school pairs fixed effects, accounting for clustered (school pairs) standard errors. Significance levels:*10%; **5%; ***1%.

5 Results

5.1 Financial Literacy and Autonomy

The program's immediate expected result is improving students' scores on financial literacy and applied math exams. This set of outcomes can be interpreted as "first stage" results, crucial for enhancing overall math achievement. By equipping students with practical skills integrated into their curriculum, the program aims to improve their ability to apply mathematical concepts in real-world financial and planning decisions, thus fostering immediate and foundational competencies.

Assessing financial literacy and applied math exam scores reveals the positive impacts of the intervention. At the first follow-up (Nov/21), students in the treatment group outperformed their peers in the control by over 0.13 SD, a substantial effect comparable in magnitude to average effects seen in other educational domains, such as reading (Kaiser and Menkhoff, 2020). While slightly diminished, this positive effect persisted into the second follow-up (Nov/22) with a difference of approximately 0.09 SD between treatment and control students. The sustained, albeit reduced, impact indicates that the learning boosts provided by the program are substantial, though the effect size tends to decrease after two rounds of the intervention (one in the 9th- and another in the 10th grade).

Regarding the financial autonomy index, we do not find evidence of an impact of the program. This indicator, which assesses students' self-reported confidence and autonomy in making financial decisions, showed no significant changes attributable to the program. The coefficients were small in magnitude and virtually unchanged across waves of data collection.

Table 3: Financial literacy score and financial autonomy index

	Fin. Lit./Math Score (std.)		Financial Autonomy (index, std.)	
	Follow-up 1	Follow-up 2	Follow-up 1	Follow-up 2
	(1)	(2)	(3)	(4)
Treatment	0.132*	0.090**	-0.008	-0.001
	[0.070]	[0.036]	[0.037]	[0.040]
School Pair FE	Yes	Yes	Yes	Yes
Baseline Dep. Variable	Yes	Yes	No	No
Lasso Selection Controls	Yes	Yes	Yes	Yes
Observations	5956	4494	5426	4287
School Pairs	95	93	94	95

Note: This table presents OLS regression results for the impact of the financial education program on student financial literacy, as measured by the score on the applied math test, and on the financial autonomy index as proposed by Bruhn et al. (2016). The number of students and school pairs considered in the analysis may fluctuate within a wave because not all students answered every evaluative instrument, and they fluctuate across waves because of sample attrition. Outcome variables are standardized using the mean and standard deviation of the control group to facilitate interpretation and enhance comparability with other studies. Standard errors clustered at the school pair level are shown in brackets. Significance level markers: *10%; **5%; ***1%.

We now turn to the analysis of the heterogeneous impacts of the program for students from poor socioeconomic backgrounds, identified here as those whose mothers have not completed high school [20]. This variable serves as an indicator of socioeconomic status and is used to examine how students from different backgrounds may benefit differently from the intervention.

Table 4 shows that the intervention's impact on financial literacy and applied math test scores seems to be mainly concentrated among students from poor socioeconomic statuses. Initially, at the first follow-up, the program showed an improvement in financial literacy scores, which cannot be distinguished from zero. However, with extended exposure to the program, evidenced by two rounds of the intervention, the impact on these students becomes increasingly significant. By the second follow-up, the effect intensifies, peaking at approximately 0.17 SD — a substantial increase compared to the estimated ATE of 0.09 SD.

Table 4: Financial literacy score and financial autonomy index - heterogeneity analysis

	Fin. Lit./Math Score (std.)		Financial Autonomy (index, std.)	
	Follow-up 1	Follow-up 2	Follow-up 1	Follow-up
	(1)	(2)	(3)	(4)
Treatment	0.096	0.009	0.012	-0.038
	[0.093]	[0.050]	[0.047]	[0.055]
No HS (mother)	-0.080*	-0.049	-0.002	-0.014
	[0.048]	[0.050]	[0.041]	[0.046]
Treatment × No HS (mother)	0.091	0.166**	-0.043	0.101
	[0.075]	[0.071]	[0.057]	[0.075]
School Pair FE	Yes	Yes	Yes	Yes
Baseline Dep. Variable	Yes	Yes	Yes	Yes
Lasso Selection Controls	Yes	Yes	Yes	Yes
Observations	5146	3906	4692	3718
School Pairs	95	93	94	95

Note: This table displays OLS regression results exploring heterogeneous effects of the financial education program on student financial literacy, as measured by the score on the applied math test, and on the financial autonomy index, following the methodology proposed by Bruhn et al. (2016). "No HS (mother)" denotes the dummy variable which takes the value of one for students whose mothers did not complete high school (secondary education), and zero otherwise. The number of students and school pairs considered in the analysis may fluctuate within a wave because not all students answered every evaluative instrument, and they fluctuate across waves because of sample attrition. Outcome variables are standardized using the mean and standard deviation of the control group to facilitate interpretation and enhance comparability with other studies. Standard errors clustered at the school pair level are shown in brackets. Significance level markers: *10%; **5%; ***1%.

The results suggest that the program is effective in narrowing the applied knowledge gap between students from economically disadvantaged backgrounds and their more affluent peers. As explained in

[20] We extend our analysis using other socioeconomic measures, such as the first decile and first quartile of the distribution of a socioeconomic factor summarizing several background items. The results are in line with the ones presented here and can be seen in the Robustness session of the Appendix.

Section 2, by delivering educational content directly relevant to the economic environments and challenges these students frequently encounter, the program specifically enhances their ability to understand and apply essential math concepts to financial contexts. This targeted educational effort helps improve financial literacy and specific math skills among students who might otherwise lag behind due to socioeconomic factors, thereby contributing to a reduction in the knowledge gap.

5.2 Math Attainment

Our analysis reveals interesting patterns in examining the impact of the "Learning to Deal with Money" program on math proficiency, both through school report card grades and the SAEGO standardized math exam scores. Initially, the treatment effects on transcript grades show a slight improvement, with an effect size of 0.03 SD at both follow-ups. These marginal increases suggest that while there may be a slight positive trend in overall math grades due to the program, our working sample size does not allow for detecting such small effects.

Similarly, the SAEGO math proficiency exam results show consistently positive but not statistically significant effects on the scores, with increases of 0.06 SD and 0.05 SD at the first and second follow-ups[21], respectively. It is worth noting, however, that the exam encompasses a wide array of math skills, many of which go beyond the scope of the financial education initiative. Consequently, the program's effects might be diluted among various proficiency questions, requiring a more careful analysis.

Table 5: Math attainment

	Math Grade (std.)		SAEGO Math. (std.)	
	Follow-up 1	Follow-up 2	Follow-up 1	Follow-up
	(1)	(2)	(3)	(4)
Treatment	0.027	0.033	0.061	0.047
	[0.061]	[0.071]	[0.046]	[0.058]
School Pair FE	Yes	Yes	Yes	Yes
Baseline Dep. Variable	Yes	Yes	No	No
Lasso Selection Controls	Yes	Yes	Yes	Yes
Observations	4812	4971	6308	4497
School Pairs	93	95	95	93

[21] Note that, as mentioned Section 4, the official SAEGO is only applied to the 5th, 9th and 12th grades, as so the one applied in 2021 was already prepared by the Secretary of Education of Goiás, whereas the second one, applied in 2022 for the 10th grade, was prepared by CAEd in partnership with the BEI Institute, following the curriculum guidelines of the state.

Note: This table presents OLS regression results for the impact of the financial education program on math attainment, as measured both by the school report card and by the state's standardized exam. The number of students and school pairs considered in the analysis may fluctuate within a wave because not all students answered every evaluative instrument, and they fluctuate across waves because of sample attrition. Outcome variables are standardized using the mean and standard deviation of the control group to facilitate interpretation and enhance comparability with other studies. Standard errors clustered at the school pair level are shown in brackets. Significance level markers: *10%; **5%; ***1%.

To further investigate these results, we delved into the SAEGO exam's microdata to specifically analyze the differential impacts on "program-specific skills" — those directly targeted by the financial education curriculum — and "non-program-specific skills." For instance, program-specific skills involve solving problems using percentages, interpreting data from tables and graphs, and identifying systems of first-degree equations that articulate real-world issues central to the curriculum's focus. These skills are directly relevant to financial contexts, where understanding percentages can influence financial decision-making, and interpreting graphical data or equations can be crucial in managing personal and business finances. Conversely, non-program-specific skills assessed by SAEGO include identifying relationships between quadrilaterals through their properties, using metric relations of right triangles to resolve problems, and recognizing different representations of the same rational number, among others. While foundational in mathematics, these abilities do not directly enhance financial literacy or decision-making. Out of the 36 math skills evaluated by the SAEGO exam, 17 were identified as program-specific [22].

To assess whether the program had a differential impact on these two sets of questions, we use an empirical estimation inspired on the difference-in-differences (DiD) approach:

$$score_{i,e,s,p} = \beta_0 + \beta_1 D_e + \beta_2 T_{i,s} + \beta_3 (D_e \times T_{i,s}) + \gamma_p + \epsilon_{i,e,s,p}$$

Where $score_{i,e}$ denotes the score of student i on exam e, D_e is a dummy variable that takes the value 1 if the exam score is related to program-specific skills and 0 otherwise, $T_{i,s}$ denotes school-level treatment assignment (1 for treatment and 0 for control), and γ_p are matched-pair fixed effects. The interaction term $D_e \times T_{i,s}$ allows us to identify the differential impact of the treatment on program-specific skills compared to other skills.

The results show that the program has a positive impact on math skills that the intervention directly aims to enhance. This finding underscores the effectiveness of the program in improving the specific math competencies worked within its framework.

On the other hand, there is encouraging news when we focus our attention on the heterogeneous impacts for students from poorer socioeconomic backgrounds, as depicted in Table 7. For these students, the treatment interaction terms in the regression models indicate a notable positive deviation from the general trend. In the first follow-up, there is an observable improvement in overall math proficiency, with a statistically significant increase in SAEGO math proficiency of about 0.15 SD. This uplift is a clear indication that the program is making substantial strides in addressing educational disparities among economically disadvantaged students. Continuing into the second year of the program, after two rounds of

[22] More details on the full list of skills are shown in the Appendix

Table 6: Program-Specific Math Skills (SAEGO) (Std.)

	DiD-type model (1)
Spec. skills score	-0.061***
	[0.005]
Treatment	0.002
	[0.012]
Treat. Effect on the Diff.	0.012*
	[0.007]
School Pair FE	Yes
Baseline Dep. Variable	No
Lasso Selection Controls	No
Observations	12612
School Pairs	95

Note: The table presents the impact of the intervention on the difference between students performance on program-specific and non-specific math skills assessed by SAEGO. We use a differences-in-differences type regression, with standard errors clustered by school pairs shown in brackets. Significance levels markers: *10%; **5%; ***1%.

implementation, this positive trend persists and even expands, with a significant rise of 0.13 SD in math grades as recorded on school report cards. The results suggest that sustained participation in the program not only helps maintain but actually enhances the gains in math proficiency among these students over time.

Table 7: Math attainment - heterogeneity analysis

	Math Grade (std.)		SAEGO Math. (std.)	
	Follow-up 1 (1)	Follow-up 2 (2)	Follow-up 1 (3)	Follow-up (4)
Treatment	-0.016	-0.008	0.008	-0.026
	[0.066]	[0.078]	[0.058]	[0.069]
No HS (mother)	-0.103***	-0.097**	-0.213***	-0.205***
	[0.035]	[0.044]	[0.042]	[0.056]
Treatment × No HS (mother)	0.076	0.133**	0.148***	0.145**
	[0.053]	[0.061]	[0.056]	[0.069]
School Pair FE	Yes	Yes	Yes	Yes
Baseline Dep. Variable	Yes	Yes	Yes	Yes
Lasso Selection Controls	Yes	Yes	Yes	Yes
Observations	4068	4318	5440	3909
School Pairs	93	95	95	93

Note: This table displays OLS regression results exploring heterogeneous effects of the financial education program on math attainment, as measured by the school report card grades and the SAEGO standardized exam. "No HS (mother)" denotes the dummy variable which takes the value of one for students whose mothers did not complete high school (secondary education), and zero otherwise. The number of students and school pairs considered in the analysis may fluctuate within a wave because not all students answered every evaluative instrument, and they fluctuate across waves because of sample attrition. Outcome variables are standardized using the mean and standard deviation of the control group to facilitate interpretation and enhance comparability with other studies. Standard errors clustered at the school pair level are shown in brackets. Significance level markers: *10%; **5%; ***1%.

5.3 Student Motivation and Engagement

We now turn our attention to the program's potential effects on student interest in mathematics and measures of general student engagement, including their perception of proactive study strategies and willingness to finish high school. Whereas the broader aggregate indexes on students' interest and perception of study strategies, as well as their willingness to finish high school, do not show statistically significant changes (Table 8), a closer examination of individual components of the index on interest uncovers subtle yet meaningful insights into how the program could be enhancing math attainment through non-cognitive mechanisms.

In exploring these individual survey responses, we uncover that the program significantly shifts students' attitudes towards mathematics, particularly by recognizing its practical relevance and importance in everyday life (see Table 9). This is especially evident in how students begin to see the value of mathematics for practical applications, such as assisting their families. Over time, these perceptions evolve, with students increasingly recognizing the subject as crucial for achieving their life dreams (Table 10).

Table 8: Interest in math and school-related motivation

	Interest in Math (index, std.)		Study Strategies (index, std.)		Wants to finish school (dummy)	
	Follow-up 1	Follow-up 2	Follow-up 1	Follow-up 2	Follow-up 1	Follow-up 2
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.043	0.059	0.030	-0.008	-0.005	0.023
	[0.060]	[0.048]	[0.049]	[0.048]	[0.012]	[0.018]
School Pair FE	Yes	Yes	Yes	Yes	Yes	Yes
Baseline Dep. Variable	Yes	Yes	Yes	Yes	Yes	Yes
Lasso Selection Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5483	4302	5502	4304	5486	4302
School Pairs	94	95	94	95	94	95

Note: This table presents OLS regression results for the impact of the financial education program on student motivation and their interest in mathematics. Three outcomes were analyzed at this point: first, an index that aggregates all survey questions related to interest in math; second, an index that captures proactive study strategies within math domain; finally, a dummy that takes the value of one when students recognize that they want to finish high school. The number of students and school pairs considered in the analysis may fluctuate within a wave because not all students answered every evaluative instrument, and they fluctuate across waves because of sample attrition. Outcome variables are standardized using the mean and standard deviation of the control group to facilitate interpretation and enhance comparability with other studies. Standard errors clustered at the school pair level are shown in brackets. Significance level markers: *10%; **5%; ***1%.

Table 9: Interest in mathematics - individual questions (follow-up 1)

	General interest	Importance to achieve dreams	Importance to help the family	One of the key school subjects	Not important in the routine	Helps with other subjects	Only students who like it should take classes
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treatment	-0.025	0.050	0.131***	0.013	0.018	-0.026	-0.056
	[0.047]	[0.047]	[0.046]	[0.050]	[0.052]	[0.042]	[0.055]
Original p-value	0.60	0.30	0.00	0.80	0.72	0.53	0.31
RW p-value	0.68	0.22	0.00	0.75	0.75	0.64	0.22
School Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline Dep. Variable	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lasso Selection Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5483	5483	5483	5483	5483	5483	5483
School Pairs	94	94	94	94	94	94	94

Note: This table presents OLS regression results for the impact of the financial education program on the interest of students in mathematics. We break this analysis down by looking at the impact at each of the individual questions. Romano-Wolf correction of standard errors was employed so as to adjust for family-wise error rate when testing for multiple hypotheses simultaneously (Romano and Wolf, 2005). The number of students and school pairs considered in the analysis may fluctuate within a wave because not all students answered every evaluative instrument, and they fluctuate across waves because of sample attrition. Here the values for outcome variables range from 1 to 4 (Likert scale). Standard errors clustered at the school pair level are shown in brackets. Significance level markers: *10%; **5%; ***1%.

Table 10: Interest in mathematics - individual questions (follow-up 2)

	General interest	Importance to achieve dreams	Importance to help the family	One of the key school subjects	Not important in the routine	Helps with other subjects	Only students who like it should take classes
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treatment	0.051	0.070*	0.071*	0.030	-0.015	0.005	0.023
	[0.050]	[0.039]	[0.041]	[0.041]	[0.052]	[0.031]	[0.042]
Original p-value	0.31	0.07	0.08	0.46	0.78	0.87	0.58
RW p-value	0.39	0.03	0.04	0.65	0.89	0.89	0.75
School Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline Dep. Variable	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lasso Selection Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4305	4306	4306	4306	4306	4303	4302
School Pairs	95	95	95	95	95	95	95

Note: This table presents OLS regression results for the impact of the financial education program on the interest of students in mathematics. We break this analysis down by looking at the impact at each of the individual questions. Romano-Wolf correction of standard errors was employed so as to adjust for family-wise error rate when testing for multiple hypotheses simultaneously (Romano and Wolf, 2005). The number of students and school pairs considered in the analysis may fluctuate within a wave because not all students answered every evaluative instrument, and they fluctuate across waves because of sample attrition. Here the values for outcome variables range from 1 to 4 (Likert scale). Standard errors clustered at the school pair level are shown in brackets. Significance level markers: *10%; **5%; ***1%.

For students from economically disadvantaged backgrounds, the "Learning to Deal with Money" program demonstrates particularly significant impacts in fostering an interest in mathematics. After two rounds of the intervention, we observe a discernible increase in the general interest in math as measured by our aggregate index (Table 11). This heightened interest appears to be driven by two key perceptions that develop more strongly in these students over time. Firstly, there is an increased recognition of the relevance of mathematics in achieving personal dreams, underscoring the subject's practical importance in shaping their future aspirations. Secondly, these students increasingly view mathematics as one of the most important subjects taught in school, highlighting a broader educational recognition and appreciation (Table 13).

This shift is highly relevant as it indicates that the program is not only succeeding in making math more engaging through its applied learning focus but is also altering the perceived value of mathematics among those who might benefit the most. For students whose parents have fewer resources, understanding the practical utility of mathematics in real-world applications and its critical role in personal and professional success can be particularly significant. This enhanced appreciation can lead to greater motivation, more dedicated engagement with the subject, and, ultimately, improved educational outcomes.

This explanation thus sheds light on mechanisms through which these students experienced an improvement in math attainment, as explained in the previous subsection. The linkage between students' heightened perception of math's relevance and their educational performance is crucial. By recognizing mathematics as a key tool for achieving personal and familial goals, these students are likely to engage more actively and persistently with the material, ultimately improving their proficiency in the subject.

The intentionality of the program in building interest in mathematics through applied learning appears to be a critical factor in achieving these results. The curriculum is specifically designed to bridge theoretical mathematical concepts with real-world applications, making learning more tangible and directly relevant to the students' lives. This approach enhances the immediacy and utility of mathematical knowledge and

significantly boosts student interest and valuation of the subject. By intentionally focusing on applied learning, the program seems to effectively engage students in a manner that traditional approaches may not, fostering both cognitive and non-cognitive skills that contribute to more sustained involvement in the subject.

Table 11: Interest in math and school-related motivation - heterogeneity analysis

	Interest in Math (index, std.)		Study Strategies (index, std.)		Wants to finish school (dummy)	
	Follow-up 1	Follow-up 2	Follow-up 1	Follow-up 2	Follow-up 1	Follow-up 2
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.031	-0.001	0.010	-0.046	-0.007	0.003
	[0.079]	[0.057]	[0.056]	[0.059]	[0.015]	[0.020]
No HS (mother)	0.015	-0.060	0.047	-0.020	-0.009	-0.006
	[0.045]	[0.052]	[0.047]	[0.049]	[0.015]	[0.017]
Treatment × No HS (mother)	0.070	0.130*	0.032	0.070	0.002	0.020
	[0.066]	[0.075]	[0.065]	[0.074]	[0.022]	[0.027]
School Pair FE	Yes	Yes	Yes	Yes	Yes	Yes
Baseline Dep. Variable	Yes	Yes	Yes	Yes	Yes	Yes
Lasso Selection Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4738	3730	4752	3732	4739	3732
School Pairs	94	95	94	95	94	95

Note: This table presents OLS regression results for the heterogeneous impacts of the financial education program on student motivation and their interest in mathematics. Three outcomes were analyzed at this point: first, an index that aggregates all survey questions related to interest in math; second, an index that captures proactive study strategies within math domain; finally, a dummy that takes the value of one when students recognize that they want to finish high school. "No HS (mother)" denotes the dummy variable which takes the value of one for students whose mothers did not complete high school (secondary education), and zero otherwise. The number of students and school pairs considered in the analysis may fluctuate within a wave because not all students answered every evaluative instrument, and they fluctuate across waves because of sample attrition. Outcome variables are standardized using the mean and standard deviation of the control group to facilitate interpretation and enhance comparability with other studies. Standard errors clustered at the school pair level are shown in brackets. Significance level markers: *10%; **5%; ***1%.

Table 12: Interest in mathematics - individual questions (follow-up 1) - heterogeneity analysis

	General interest	Importance to achieve dreams	Importance to help the family	One of the key school subjects	Not important in the routine	Helps with other subjects	Only students who like it should take classes
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treatment	-0.012	0.063	0.134**	-0.025	-0.012	-0.056	-0.082
	[0.062]	[0.060]	[0.061]	[0.067]	[0.063]	[0.059]	[0.071]
No HS (mother)	0.033	0.041	0.008	0.012	-0.080	-0.019	-0.049
	[0.041]	[0.042]	[0.041]	[0.041]	[0.048]	[0.037]	[0.051]
Treatment × No HS (mother)	-0.003	0.026	0.036	0.099	0.041	0.068	-0.002
	[0.056]	[0.060]	[0.056]	[0.061]	[0.065]	[0.055]	[0.077]
Original p-value (HTE)	0.95	0.66	0.52	0.10	0.53	0.21	0.97
RW p-value (HTE)	0.99	0.87	0.87	0.10	0.87	0.33	0.99
School Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline Dep. Variable	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lasso Selection Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4738	4738	4738	4738	4738	4738	4738
School Pairs	94	94	94	94	94	94	94

Note: This table presents OLS regression results for the impact of the financial education program on the interest of students in the subject of mathematics. We break this analysis down by looking at the impact on each of the individual questions. Romano-Wolf correction of standard errors was employed so as to adjust for family-wise error rate when testing for multiple hypotheses simultaneously (Romano and Wolf, 2005). "No HS (mother)" denotes the dummy variable which takes the value of one for students whose mothers did not complete high school (secondary education), and zero otherwise. The number of students and school pairs considered in the analysis may fluctuate within a wave because not all students answered every evaluative instrument, and they fluctuate across waves because of sample attrition. Here the values for outcome variables range from 1 to 4 (Likert scale). Standard errors clustered at the school pair level are shown in brackets. Significance level markers: *10%; **5%; ***1%.

Table 13: Interest in mathematics - individual questions (follow-up 2) - heterogeneity analysis

	General interest	Importance to achieve dreams	Importance to help the family	One of the key school subjects	Not important in the routine	Helps with other subjects	Only students who like it should take classes
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treatment	-0.004	0.032	0.059	-0.021	-0.024	-0.033	-0.001
	[0.061]	[0.044]	[0.044]	[0.053]	[0.069]	[0.040]	[0.053]
No HS (mother)	-0.039	-0.022	0.009	-0.069	-0.019	-0.043	-0.040
	[0.050]	[0.046]	[0.044]	[0.045]	[0.061]	[0.038]	[0.054]
Treatment × No HS (mother)	0.058	0.124*	0.028	0.130*	0.051	0.086	0.066
	[0.071]	[0.063]	[0.064]	[0.066]	[0.080]	[0.064]	[0.070]
Original p-value (HTE)	0.41	0.05	0.66	0.05	0.53	0.18	0.35
RW p-value (HTE)	0.50	0.04	0.57	0.04	0.57	0.22	0.50
School Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline Dep. Variable	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lasso Selection Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3733	3734	3734	3734	3734	3731	3730
School Pairs	95	95	95	95	95	95	95

Note: This table presents OLS regression results for the impact of the financial education program on the interest of students in the subject of mathematics. We break this analysis down by looking at the impact on each of the individual questions. Romano-Wolf correction of standard errors was employed so as to adjust for family-wise error rate when testing for multiple hypotheses simultaneously (Romano and Wolf, 2005). "No HS (mother)" denotes the dummy variable which takes the value of one for students whose mothers did not complete high school (secondary education), and zero otherwise. The number of students and school pairs considered in the analysis may fluctuate within a wave because not all students answered every evaluative instrument, and they fluctuate across waves because of sample attrition. Here the values for outcome variables range from 1 to 4 (Likert scale). Standard errors clustered at the school pair level are shown in brackets. Significance level markers: *10%; **5%; ***1%.

5.4 Socio-Emotional Skills

One of this paper's main contributions is to provide a comprehensive evaluation of the educational impacts of including financial education in the math curriculum to bridge the gap between theoretical concepts and their applicability, as well as improve financial literacy. Such a broad analysis includes an assessment of objective outcomes, such as math attainment, as well as student engagement and socio-emotional skills that could be affected by the new curriculum. As presented in Section 4, taking into account few but high-impact studies that have shown that financial education has the potential to affect socio-emotional competencies, namely self-control and patience, we incorporate the investigation of other soft skills we believe might be affected by the emphasis on forward-looking behaviors and the learning experience as a whole, notably internal locus of control, grit and growth mindset.

Our analysis of the ATE on these outcomes shows a striking result, with an initial negative impact on students' growth mindset of 0.06 SD that fades away after prologed program exposure, by the end of the second round of intervention. We interpret this as a response to introducing new content and methodologies into the math curriculum during the sensitive period of schools reopening after the most severe period of the COVID-19 pandemic in the country, in line with findings by Crispim et al. (2022). The authors show that the pandemic significantly impacted Brazilian students' socio-emotional skills, with heightened stress and anxiety levels arising from extended isolation and disruptions in their routines. Also, they argue that, as schools reopened in 2021, issues such as concentration difficulties and struggles with anxiety and insecurity became increasingly evident. In this sense, an initially perceived complexity of the content may have led already stressed and anxious students to doubt their abilities to grasp the content, unintentionally reinforcing a fixed mindset. This effect, however, disappeared as students became more familiar with the subject over time.

While we do not observe significant effects neither on the internal locus of control nor on grit in the ATE analysis, as shown in Table 14, we do observe an improvement of the former for students from a poorer socioeconomic background. This result is in line with their enhanced academic performance, as shown by the financial literacy scores and overall math grades in the school transcript and SAEGO exam. In fact, these results reveal that the program seems to have first impacted these students' interest in financial literacy and internal locus of control, according to the results from the first year, then subsequently improving their academic performance in the following period.

Table 14: Socioemotional skills (indexes, std)

	Int. Locus of Control		Growth Mindset		Grit	
	Follow-up 1	Follow-up 2	Follow-up 1	Follow-up 2	Follow-up 1	Follow-up 2
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	-0.017	-0.003	-0.057*	0.026	0.024	0.051
	[0.044]	[0.052]	[0.033]	[0.043]	[0.037]	[0.035]
School Pair FE	Yes	Yes	Yes	Yes	Yes	Yes
Baseline Dep. Variable	Yes	Yes	Yes	Yes	Yes	Yes
Lasso Selection Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5453	4297	5510	4306	5463	4294
School Pairs	94	95	94	95	94	95

Note: This table presents OLS regression results for the impact of the financial education program on students' socio-emotional skills (internal locus of control, growth mindset and grit). The number of students and school pairs considered in the analysis may fluctuate within a wave because not all students answered every evaluative instrument, and they fluctuate across waves because of sample attrition. Outcome variables are standardized using the mean and standard deviation of the control group to facilitate interpretation and enhance comparability with other studies. Standard errors clustered at the school pair level are shown in brackets. Significance level markers: *10%; **5%; ***1%.

Table 15: Socioemotional skills - heterogeneity analysis (indexes, std)

	Int. Locus of Control		Growth Mindset		Grit	
	Follow-up 1	Follow-up 2	Follow-up 1	Follow-up 2	Follow-up 1	Follow-up 2
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	-0.056	0.001	-0.071	0.048	0.055	0.057
	[0.051]	[0.062]	[0.046]	[0.053]	[0.044]	[0.045]
No HS (mother)	-0.091***	-0.044	-0.099**	0.087*	0.042	0.046
	[0.035]	[0.053]	[0.049]	[0.053]	[0.035]	[0.043]
Treatment × No HS (mother)	0.113*	0.071	0.033	-0.077	-0.063	0.007
	[0.058]	[0.065]	[0.065]	[0.069]	[0.051]	[0.058]
School Pair FE	Yes	Yes	Yes	Yes	Yes	Yes
Baseline Dep. Variable	Yes	Yes	Yes	Yes	Yes	Yes
Lasso Selection Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4712	3726	4759	3734	4721	3723
School Pairs	94	95	94	95	94	95

Note: This table displays OLS regression results exploring heterogeneous effects of the financial education program on students' socio-emotional skills. "No HS (mother)" denotes the dummy variable, which takes the value of one for students whose mothers did not complete high school (secondary education) and zero otherwise. The number of students and school pairs considered in the analysis may fluctuate within a wave because not all students answered every evaluative instrument, and they fluctuate across waves because of sample attrition. Outcome variables are standardized using the mean and standard deviation of the control group to facilitate interpretation and enhance comparability with other studies. Standard errors clustered at the school pair level are shown in brackets. Significance level markers: *10%; **5%; ***1%

5.5 Readiness for the Labor Market

Still concerning socio-emotional dimensions, we also evaluate the program's effects on skills relevant to the labor market, as identified by the new instrument developed by the Laboratory for Studies and Research in Education and Social Economy from the University of São Paulo (LEPES-USP). This instrument assesses and standardizes young Brazilians' performance in skills seen as crucial by employing organizations.

From the large set of competencies assessed by the complete questionnaire, we restrict our analysis to seven that we believe could be affected by the program through the stimuli to forward-looking behaviors. The tables 16, 17 and 18 below show the impacts' estimates on standard deviations found in the midline collection (Mar/2022) and in the second follow-up (Nov/2022). As previously discussed, we use the midline collection instead of the first follow-up because this instrument was only applied to 10th-grade students. It is worth highlighting, however, that this survey was applied before a second exposure to the program and around five months after the end of the first dose of the intervention.

As seen in Table 16, the program temporarily increases treated students' decision-making capacity, even after months the first application has ended. This result is in line with the proposal of a financial education program that seeks to master tools to think about the future, notably at an age when teenagers are expected to be planning their next years and making crucial decisions, such as career choices. Despite the initial impact of 8% of a standard deviation, the effect seems to vanish after the program's second year, possibly related to a novelty effect. We do not find a significant impact on other skills, but we still observe a positive estimate in most of them initially, followed by an apparent decline.

Table 16: Skills for the Labor Market (1/3) - indexes (std)

	Make Decisions		Prioritize Tasks		Solve Problems	
	Midline	Follow-up 2	Midline	Follow-up 2	Midline	Follow-up 2
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.079**	-0.054	-0.015	0.020	0.014	-0.002
	[0.037]	[0.037]	[0.044]	[0.052]	[0.038]	[0.044]
School Pair FE	Yes	Yes	Yes	Yes	Yes	Yes
Baseline Dep. Variable	No	No	No	No	No	No
Lasso Selection Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4688	4422	4628	4395	4623	4391
School Pairs	94	95	94	95	94	95

Note: This table presents OLS regression results for the impact of the financial education program on a first set of skills seen as relevant for the labor market (decision-making ability, ability to prioritize tasks, and to solve problems). The outcomes are indexes computed by the Laboratory LEPES from the University of Sao Paulo based on students' answers. The variables are standardized using the mean and standard deviation of the control group to facilitate interpretation and enhance comparability with other studies. The number of students and school pairs considered in the analysis may fluctuate within a wave because not all students answered every evaluative instrument, and they fluctuate across waves because of sample attrition. Standard errors clustered at the school pair level are shown in brackets. Significance level markers: *10%; **5%; ***1%.

Table 17: Skills for the Labor Market (2/3) - indexes (std)

	Responsibility and Commitment		Frustration Tolerance	
	Midline	Follow-up 2	Midline	Follow-up 2
	(1)	(2)	(3)	(4)
Treatment	0.033	0.016	-0.008	-0.003
	[0.042]	[0.056]	[0.032]	[0.037]
School Pair FE	Yes	Yes	Yes	Yes
Baseline Dep. Variable	No	No	No	No
Lasso Selection Controls	Yes	Yes	Yes	Yes
Observations	4613	4387	4616	4387
School Pairs	94	95	94	95

Note: This table presents OLS regression results for the impact of the financial education program on another set of skills seen as relevant for the labor market (responsibility and commitment, and tolerance to frustrations). The outcomes are indexes computed by the Laboratory LEPES from the University of Sao Paulo based on students' answers. The variables are standardized using the mean and standard deviation of the control group to facilitate interpretation and enhance comparability with other studies. The number of students and school pairs considered in the analysis may fluctuate within a wave because not all students answered every evaluative instrument, and they fluctuate across waves because of sample attrition. Standard errors clustered at the school pair level are shown in brackets. Significance level markers: *10%; **5%; ***1%.

Table 18: Skills for the Labor Market (3/3) - indexes (std)

	Learning to Learn		Plan a Career		Readiness Mean (std.)	
	Midline	Follow-up 2	Midline	Follow-up 2	Midline	Follow-up 2
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.028	-0.005	0.036	-0.042	0.028	-0.017
	[0.039]	[0.046]	[0.042]	[0.040]	[0.040]	[0.048]
School Pair FE	Yes	Yes	Yes	Yes	Yes	Yes
Baseline Dep. Variable	No	No	No	No	No	No
Lasso Selection Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4662	4407	4651	4401	4594	4364
School Pairs	94	95	94	95	94	95

Note: This table presents OLS regression results for the impact of the financial education program on another set of skills seen as relevant for the labor market (learning how to learn and ability to plan a career), as well as on the mean of the skills. The skills outcomes are indexes computed by the Laboratory LEPES from the University of Sao Paulo based on students' answers. The variables are standardized using the mean and standard deviation of the control group to facilitate interpretation and enhance comparability with other studies. The number of students and school pairs considered in the analysis may fluctuate within a wave because not all students answered every evaluative instrument, and they fluctuate across waves because of sample attrition. Standard errors clustered at the school pair level are shown in brackets. Significance level markers: *10%; **5%; ***1%.

Assessing the heterogeneous impacts of the program on the readiness for the labor market dimension, we observe more solid and positive effects on students' capacity to solve problems by a magnitude of 0.15 SD by the end of the second year and in their frustration tolerance by 0.12 SD. These results are in line with the impact on their academic achievement and in their internal locus of control as presented earlier.

Table 19: Skills for the Labor Market (1/3) - heterogeneity analysis (indexes, std)

	Make Decisions		Prioritize Tasks		Solve Problems	
	Midline	Follow-up 2	Midline 1	Follow-up 2	Midline 1	Follow-up 2
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.102**	-0.080*	-0.018	-0.011	0.007	-0.085
	[0.042]	[0.042]	[0.061]	[0.067]	[0.047]	[0.054]
No HS (Mother)	-0.018	-0.098**	-0.016	-0.048	-0.037	-0.095*
	[0.048]	[0.048]	[0.050]	[0.048]	[0.045]	[0.053]
Treatment x No HS (mother)	-0.063	0.063	0.021	0.060	0.018	0.145**
	[0.061]	[0.066]	[0.070]	[0.066]	[0.063]	[0.071]
School Pair FE	Yes	Yes	Yes	Yes	Yes	Yes
Baseline Dep. Variable	Yes	Yes	Yes	Yes	Yes	Yes
Lasso Selection Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4079	3840	4028	3812	4025	3808
School Pairs	94	95	94	95	94	95

Note: This table displays OLS regression results exploring heterogeneous effects of the financial education program on students' labor market skills. "No HS (mother)" denotes the dummy variable, which takes the value of one for students whose mothers did not complete high school (secondary education) and zero otherwise. The skills outcomes are indexes computed by the Laboratory LEPES from the University of Sao Paulo based on students' answers. The variables are standardized using the mean and standard deviation of the control group to facilitate interpretation and enhance comparability with other studies. The number of students and school pairs considered in the analysis may fluctuate within a wave because not all students answered every evaluative instrument, and they fluctuate across waves because of sample attrition. Standard errors clustered at the school pair level are shown in brackets. Significance level markers: *10%; **5%; ***1%.

Table 20: Skills for the Labor Market (2/3) - heterogeneity analysis (indexes, std)

	Responsibility and Commitment		Frustration Tolerance	
	Midline	Follow-up 2	Midline	Follow-up 2
	(1)	(2)	(3)	(4)
Treatment	0.055	-0.026	-0.021	-0.076
	[0.051]	[0.067]	[0.046]	[0.048]
No HS (Mother)	0.012	-0.029	-0.008	-0.033
	[0.044]	[0.051]	[0.048]	[0.053]
Treatment x No HS (Mother)	-0.022	0.049	0.003	0.122*
	[0.064]	[0.067]	[0.061]	[0.071]
School Pair FE	Yes	Yes	Yes	Yes
Baseline Dep. Variable	No	No	No	No
Lasso Selection Controls	Yes	Yes	Yes	Yes
Observations	4017	3804	4019	3804
School Pairs	94	95	94	95

Note: This table displays OLS regression results exploring heterogeneous effects of the financial education program on students' labor market skills. "No HS (mother)" denotes the dummy variable, which takes the value of one for students whose mothers did not complete high school (secondary education) and zero otherwise. The skills outcomes are indexes computed by the Laboratory LEPES from the University of Sao Paulo based on students' answers. The variables are standardized using the mean and standard deviation of the control group to facilitate interpretation and enhance comparability with other studies. The number of students and school pairs considered in the analysis may fluctuate within a wave because not all students answered every evaluative instrument, and they fluctuate across waves because of sample attrition. Standard errors clustered at the school pair level are shown in brackets. Significance level markers: *10%; **5%; ***1%.

Table 21: Skills for the Labor Market (3/3) - heterogeneity analysis (indexes, std)

	Learning to Learn		Plan a Career		Readiness for LM (mean, std.)	
	Midline	Follow-up 2	Midline	Follow-up 2	Midline	Follow-up 2
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.023	-0.014	0.043	-0.065	0.033	-0.063
	[0.049]	[0.053]	[0.048]	[0.044]	[0.049]	[0.054]
No HS (Mother)	-0.008	-0.050	-0.040	-0.044	-0.017	-0.067
	[0.043]	[0.051]	[0.040]	[0.043]	[0.045]	[0.048]
Treatment x No HS (Mother)	-0.005	-0.017	-0.002	0.007	-0.009	0.068
	[0.059]	[0.067]	[0.059]	[0.060]	[0.058]	[0.063]
School Pair FE	Yes	Yes	Yes	Yes	Yes	Yes
Baseline Dep. Variable	Yes	Yes	Yes	Yes	Yes	Yes
Lasso Selection Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4057	3825	4048	3817	4000	3784
School Pairs	94	95	94	95	94	95

Note: This table displays OLS regression results exploring heterogeneous effects of the financial education program on students' labor market skills, as well as on the mean of these skills. "No HS (mother)" denotes the dummy variable, which takes the value of one for students whose mothers did not complete high school (secondary education) and zero otherwise. The skills outcomes are indexes computed by the Laboratory LEPES from the University of Sao Paulo based on students' answers. The variables are standardized using the mean and standard deviation of the control group to facilitate interpretation and enhance comparability with other studies. The number of students and school pairs considered in the analysis may fluctuate within a wave because not all students answered every evaluative instrument, and they fluctuate across waves because of sample attrition. Standard errors clustered at the school pair level are shown in brackets. Significance level markers: *10%; **5%; ***1%.

6 Conclusion

This paper undertook a comprehensive examination of the "Learning to Deal with Money" program, a school-based financial education initiative implemented in public schools in the state of Goiás, Brazil. The study's primary objective was to fill the gap in the related literature, bringing the impacts of a school-based financial education program on student motivation and related school achievement. For this, we used an experimental setting and leveraged the survey and complementary administrative data to investigate students' math attainment, financial literacy, interest in mathematics, and relevant socio-emotional skills.

Our paper contributes to the literature on financial education as one of the first studies to rigorously explore the impacts of school-based programs beyond the strict scope of financial literacy and downstream behaviors. It also provides evidence to the literature on education in developing countries that incorporating more applied content into core subjects can enhance educational outcomes. This finding underscores the potential benefits of curricular integration in addressing the consistently low academic performance of students in middle and low-income countries and the general lack of school appeal. Examining a broad set of soft skills adds to the study, providing a rich analysis of the interplay between these effects, academic outcomes, and aspects of student motivation and engagement.

We find evidence that the program improved financial literacy and related math skills by 0.13 standard deviations, a result comparable in magnitude to the average effect of programs focusing on other educational domains, and that slightly diminished over time but persisted to the second year, with an impact of 0.09 SD. This finding aligns with the previous literature (Kaiser and Menkhoff, 2020) on financial education programs for youth. Examining regular mathematics performance, with administrative data on final transcript grades and the state standardized exam, we find that the initiative seems to increase math skills that were worked through the program's activities.

Importantly, our findings indicate that the effects on academic outcomes are accompanied by increased interest and study engagement in mathematics. Notably, treated students are more likely to recognize the value of learning math, such as in helping them provide better life conditions for their families. After the second year of contact with the program, they are also more prone to see mathematics as crucial for achieving their dreams. A crucial result is that the program is remarkably effective for students from more vulnerable socioeconomic backgrounds. Looking at the heterogeneous effects, we find that the initiative helps these students increase their financial literacy and applied math skills by a greater magnitude. They also show more interest in math and present a significant increase in their regular mathematics grades and the official state exam's overall standardized math scores.

On the socio-emotional side, we find positive effects on students' decision-making ability, a relevant skill for the labor market, and on most vulnerable students' internal locus of control, finding that aligns with their aforementioned enhanced academic performance. For the first year of the program, a striking result was a negative effect on student growth mindset, which we understand as related to the challenging context these teenagers were facing with the recent overcome of the most severe period of COVID-19 pandemic in the country and the reopening of schools. We do not find evidence of impacts on downstream financial behaviors, which aligns with the literature that indicates that behavioral effects are often limited in the short term (Bruhn et al., 2016; Kaiser et al., 2022).

Taking the results altogether, especially for students from lower socioeconomic backgrounds, our findings suggest that an integrated financial education program can substantially impact the students' math performance and financial literacy after a longer exposure, helping to close the knowledge gap and inequalities. The mechanisms behind these impacts seem to be the increased interest in math, as well as an enhanced internal locus of control. Additionally, we also observe heterogeneous impacts on more vulnerable students on other socio-emotional skills for the labor market, suggesting that such integration can be a powerful tool to combat inequalities arising from different socioeconomic backgrounds-

Looking ahead, our findings call for further research into several critical areas. A crucial next step is to investigate the longer-term effects of the intervention, particularly in terms of financial behaviors and habits, which may take more time to manifest. Also, a relevant avenue of research is to understand the long-term effects on socio-emotional skills and students' motivation to comprehend their spillover impacts on individuals' future academic and labor market outcomes.

In summary, this paper offers a comprehensive perspective on the educational impacts of an applied curriculum in mathematics, benefiting from the increasing demand for financial education programs. The lessons learned here underscore the potential benefits of curricular integration and more applied math classes, especially for the most vulnerable students.

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Appendix A

A.1 Sampling Strategy

As presented in the text, the sample selection made use of a stratified draw based on what we have been calling similarity units. These were defined using the following approach: for each regional section of the state educational system with a reasonable number of hybrid schools (eight or more), four similarity units were formed based on the distribution of the 2019 SAEGO mathematics scores in that region (the first unit then corresponds to schools who were in the first math quartile, the second to schools with performance between the 25th and the 50th percentile of the distribution, and so on). As the number of schools in each region varies considerably, some similarity units were with 9 schools, while others had only two. In smaller regional sections (fifteen out of the forty), schools were divided into just two groups (below or above the median score) or were not grouped at all (this was the case of three regions with less than four hybrid schools).

Once the similarity units were defined, sampling tests were performed to assess the representativeness of this approach. In particular, the following process was repeated twenty times and, for each resulting sample, it was tested how representative of the hybrid schools it was: a random number was assigned to each school and, within each similarity unit, schools with a number less than or equal to the 47th percentile were selected.

The representativeness assessment was based on the analysis of the distributions (tables below) of the following variables: mathematics and literacy scores in the 2018 and 2019 SAEGO; the performance of schools in the IDEB from 2015 and 2017; the number of students enrolled in the 9th grade and the total enrollment in the schools. Additionally, Kolmogorov-Smirnov tests were performed to assess the similarity in the distribution of each of the variables in the resulting samples and in the set of the other hybrid schools. Of the twenty resulting samples, in only three of them did any of the variables present a distribution statistically different from the rest of the hybrid schools.

This was considered a good result and the methodology applied again (21st stratified draw) to define the official sample of 201 schools. Kolmogorov-Smirnov tests suggested that the distribution of relevant variables in the sample was similar to the rest of the population. After the sampling, however, the Education Secretary informed us that 5 schools out of the 201 were undergoing reorganization and, therefore, would not be able to participate in the study.

Due to the proximity of the baseline, the solution adopted was again a stratified random selection of 4 new schools from the similarity units with the highest number of schools (twelve). The choice of 4 units out of these 12 was also made from a draw. Once the groups were defined, within each one, the school outside from the original sample and with the lowest value for the previously assigned random number (from the mentioned 21st draw) was selected.

A.2 Pair-Matching Strategy

Three sets of variables were used to define and test the school pairing approach:

The Selection Set (variables at the school level)

- percentage of students with internet access at home;
- percentage of students that answered the baseline survey;
- percentage of teachers who answered the baseline survey;
- percentage of students with available academic records.

The Students Set (variables at the school average level)

- five principal factors[23] aggregating students' answers to the baseline socioemotional section. As presented in Section 5, this block of the questionnaire corresponds to the SENNA instrument, applied in several municipalities and states throughout Brazil. The SENNA Institute is responsible for calculating the socioemotional traits scores, based on its own methodology and parameters. As at the time of the draw, the official results were not yet available, the principal component analysis was chosen to partially represent this relevant dimension in the pairing process;
- three principal factors[24] aggregating information on the socioeconomic level of the students;
- percentage of correct answers in each of the four basic financial literacy questions (on inflation, simple and compound interest, and risk diversification);
- the mean, the 25th and 75th percentiles of the 2020 mathematics grade distribution (from academic records).

The Teachers Set (variables at the school average level)

- a principal factor aggregating information on the socioeconomic level of the teachers;
- a principal factor aggregating answers to questions regarding external locus of control;
- a principal factor aggregating answers on grit and perseverance;
- a principal factor aggregating answers on self-efficacy;
- a principal factor aggregating answers on their motivation and commitment with the profession;
- the percentage of correct answers in each of the four basic financial literacy questions (on inflation, simple and compound interest, and risk diversification).

The first tested pairing model was based on a principal factor component (PCA) aggregating the following characteristics of the schools at the beginning of 2020[25]:

- dropout, failure and passing rates from 2017, 2018 and 2019;
- mathematics and literacy mean scores in 2017, 2018 and 2019 SAEGO;

[23] From a principal component analysis (PCA), statistical technique used to aggregate information from several variables.
[24] From a principal component analysis.
[25] This model would be used in the impact evaluation of that year if the pandemic had not occurred.

- school management index[26] from 2017, 2018 and 2019;
- total enrollment in school (2019) and in the 9th grade (2020);
- the socioeconomic level of the school in 2015 (latest available year at the time), computed by INEP.

In this model, the values for each year were considered as observations (pooled analysis).

The second tested model adopted the following approach: using the selection set aforementioned, a principal factor component was generated along with four groups (quartiles) based on its distribution. The variables from the teachers and students sets were used to create another principal factor aggregating important information on these dimensions. Then, within each selection group, schools were paired for proximity in this second aggregated factor. That is, schools were first grouped based on the availability of information, then paired with similar ones in terms of student and faculty characteristics.

The third model was the chosen one and is based on the following approach: initially, three principal factors were created, being one for each aforementioned set; then, these factors were used to generate a new one aggregating information from schools in all the proposed dimensions. The pairing was made for proximity in terms of this more aggregate factor.

The models were assessed based on the probability of registering imbalances in the three proposed dimensions (selection, students and teachers). For this, by proposed model, one hundred randomizations were simulated and, for each resulting draw, the assigned groups of the schools were regressed on the three sets of variables, seeking to evaluate potential selection problems in the pairing.

The table below summarizes the results, showing by model, in how many draws (out of one hundred), the variables of each dimension showed joint statistical significance. The 2nd and 3rd model presented a total number quite similar (29 and 30, respectively). However, as the latter presented a smaller number of imbalances in the selection dimension (relative to the availability of information), it was the chosen.

[26]Calculated annually by the Brazilian National Institute of Educational Studies and Research (INEP).

Appendix B

B.1 Balance Check on Non-Attritors

The tables below present the baseline characteristics for the treatment and control groups, the difference between the means and the respective p-values, considering the sample found both in the baseline and in each of the ten follow-up datasets used, five for each year of the intervention. As one can see, the balance check on non-attritors for the first-year outcomes is quite similar to the one for the whole sample, as presented in Section 4. For the second-year datasets, we observe a slight change in the pattern, with the occurrence of joint significance in the group difference with the whole set of variables.

Table 22: Baseline Balance - Non-Attritors in Survey 2021

	Control	Treatment	Diff. (T-C)	p-value
Panel A: Background characteristics				
Age	14.95	14.96	0.01	0.37
Male	0.45	0.44	-0.01	0.98
White	0.28	0.28	0.00	0.60
Socioeconomic Index (index, pca)	0.10	0.15	0.05	0.67
Panel B: Educational controls				
Always studied in public school	0.73	0.67	-0.05	0.95
Never failed a grade	0.88	0.87	-0.01	0.77
Afternoon shift	0.53	0.58	0.05	0.70
Self-management (Senna index)	-0.05	-0.12	-0.06	0.10
Negative-emotion resilience (Senna index)	-0.39	-0.47	-0.08*	0.05
Panel C: Baseline educational outcomes				
Math Grade in 2020	7.50	7.41	-0.10**	0.01
Desires to finish high-school	0.96	0.94	-0.02*	0.08
Study strategy in math (index, pca)	-0.06	-0.02	0.04**	0.04
Engagement in math (index, pca)	0.02	0.01	-0.01	0.94
Panel D: Baseline socioemotional outcomes				
Growth mindset (index, pca)	-0.01	-0.03	-0.02	0.35
Grit (index, pca)	0.10	0.03	-0.08**	0.04
Inner locus of control (index, pca)	0.70	0.70	-0.01	0.14
Panel E: Baseline financial educ. outcomes				
Financial literacy test score (perc.)	0.63	0.64	0.01	0.73
Financial Behavior (index, pca)	0.01	-0.04	-0.05	0.90

Note: Significance levels (*10%; **5%; ***1%) are captured through OLS estimation considering school pairs fixed effects and accounting for clustered (school pairs) standard errors. F-test of joint significance: 1.652*, statistically significant at 10%. Panels A and B comprise the control variables to be explored to increase the precision of the estimates, measuring characteristics related to the socioeconomic and academic background of the students. Panel C shows the baseline values for the outcomes of mathematics attainment and engagement (SAEGO is only applied at the end of the 9th grade and is therefore not available). Panel D brings the baseline values of the socio-emotional dimensions investigated, and Panel E the financial education baseline variables. Note that dimensions measured by a set of questions are assessed through indices generated by principal component analysis (pca).

Table 23: Baseline Balance - Non-Attritors in Exam 2021

	Control	Treatment	Diff. (T-C)	p-value
Panel A: Background characteristics				
Age	14.95	14.98	0.03	0.35
Male	0.45	0.45	0.00	0.91
White	0.29	0.27	-0.02	0.22
Socioeconomic Index (index, pca)	0.13	0.10	-0.03	0.44
Panel B: Educational controls				
Always studied in public school	0.73	0.69	-0.04	0.87
Never failed a grade	0.89	0.87	-0.02	0.62
Afternoon shift	0.54	0.58	0.04	0.67
Self-management (Senna index)	-0.06	-0.14	-0.09	0.29
Negative-emotion resilience (Senna index)	-0.40	-0.50	-0.10*	0.06
Panel C: Baseline educational outcomes				
Math Grade in 2020	7.51	7.37	-0.14	0.20
Desires to finish high-school	0.96	0.94	-0.02	0.18
Study strategy in math (index, pca)	-0.04	-0.00	0.04	0.27
Engagement in math (index, pca)	-0.00	0.03	0.03	0.30
Panel D: Baseline socioemotional outcomes				
Growth mindset (index, pca)	-0.02	0.01	0.02*	0.09
Grit (index, pca)	0.10	-0.00	-0.11	0.13
Inner locus of control (index, pca)	0.70	0.69	-0.01	0.26
Panel E: Baseline financial educ. outcomes				
Financial literacy test score (perc.)	0.63	0.63	0.00	0.70
Financial Behavior (index, pca)	0.03	-0.03	-0.06	0.47

Note: Significance levels (*10%; **5%; ***1%) are captured through OLS estimation considering school pairs fixed effects and accounting for clustered (school pairs) standard errors. F-test of joint significance: 1.182, not statistically significant. Panels A and B comprise the control variables to be explored to increase the precision of the estimates, measuring characteristics related to the socioeconomic and academic background of the students. Panel C shows the baseline values for the outcomes of mathematics attainment and engagement (SAEGO is only applied at the end of the 9th grade and is therefore not available). Panel D brings the baseline values of the socio-emotional dimensions investigated, and Panel E the financial education baseline variables. Note that dimensions measured by a set of questions are assessed through indices generated by principal component analysis (pca).

Table 24: Baseline Balance - Non-Attritors in Math Grades 2021

	Control	Treatment	Diff. (T-C)	p-value
Panel A: Background characteristics				
Age	15.01	15.07	0.05	0.50
Male	0.46	0.45	-0.01	0.40
White	0.27	0.25	-0.02	0.15
Socioeconomic Index (index, pca)	-0.13	-0.24	-0.11	0.21
Panel B: Educational controls				
Always studied in public school	0.80	0.79	0.00	0.96
Never failed a grade	0.85	0.83	-0.03	0.95
Afternoon shift	0.49	0.56	0.07	0.63
Self-management (Senna index)	-0.13	-0.19	-0.06	0.39
Negative-emotion resilience (Senna index)	-0.44	-0.54	-0.10**	0.02
Panel C: Baseline educational outcomes				
Math Grade in 2020	7.40	7.31	-0.09	0.29
Desires to finish high-school	0.95	0.92	-0.03	0.13
Study strategy in math (index, pca)	-0.00	0.07	0.07	0.31
Engagement in math (index, pca)	0.01	0.12	0.11**	0.03
Panel D: Baseline socioemotional outcomes				
Growth mindset (index, pca)	0.04	0.11	0.07	0.22
Grit (index, pca)	0.01	-0.05	-0.06	0.31
Inner locus of control (index, pca)	0.68	0.68	0.00	0.72
Panel E: Baseline financial educ. outcomes				
Financial literacy test score (perc.)	0.60	0.60	-0.01	0.86
Financial Behavior (index, pca)	0.09	-0.03	-0.12	0.11

Note: Significance levels (*10%; **5%; ***1%) are captured through OLS estimation considering school pairs fixed effects and accounting for clustered (school pairs) standard errors. F-test of joint significance: 1.383, not statistically significant. Panels A and B comprise the control variables to be explored to increase the precision of the estimates, measuring characteristics related to the socioeconomic and academic background of the students. Panel C shows the baseline values for the outcomes of mathematics attainment and engagement (SAEGO is only applied at the end of the 9th grade and is therefore not available). Panel D brings the baseline values of the socio-emotional dimensions investigated, and Panel E the financial education baseline variables. Note that dimensions measured by a set of questions are assessed through indices generated by principal component analysis (pca).

Table 25: Baseline Balance - Non-Attritors in SAEGO 2021

	Control	Treatment	Diff. (T-C)	p-value
Panel A: Background characteristics				
Age	14.96	14.97	0.02	0.69
Male	0.45	0.44	0.00	0.92
White	0.29	0.28	-0.01	0.40
Socioeconomic Index (index, pca)	0.13	0.10	-0.03	0.35
Panel B: Educational controls				
Always studied in public school	0.73	0.69	-0.04	0.98
Never failed a grade	0.88	0.87	-0.01	0.94
Afternoon shift	0.54	0.56	0.02	0.69
Self-management (Senna index)	-0.07	-0.14	-0.07	0.44
Negative-emotion resilience (Senna index)	-0.41	-0.51	-0.09*	0.05
Panel C: Baseline educational outcomes				
Math Grade in 2020	7.49	7.37	-0.12	0.23
Desires to finish high-school	0.96	0.94	-0.02	0.16
Study strategy in math (index, pca)	-0.05	-0.01	0.05	0.17
Engagement in math (index, pca)	0.00	0.03	0.03	0.22
Panel D: Baseline socioemotional outcomes				
Growth mindset (index, pca)	-0.02	0.00	0.02	0.10
Grit (index, pca)	0.09	-0.00	-0.10	0.15
Inner locus of control (index, pca)	0.70	0.69	-0.01	0.47
Panel E: Baseline financial educ. outcomes				
Financial literacy test score (perc.)	0.63	0.63	0.00	0.68
Financial Behavior (index, pca)	0.01	-0.05	-0.06	0.48

Note: Significance levels (*10%; **5%; ***1%) are captured through OLS estimation considering school pairs fixed effects and accounting for clustered (school pairs) standard errors. F-test of joint significance: 1.109, not statistically significant. Panels A and B comprise the control variables to be explored to increase the precision of the estimates, measuring characteristics related to the socioeconomic and academic background of the students. Panel C shows the baseline values for the outcomes of mathematics attainment and engagement (SAEGO is only applied at the end of the 9th grade and is therefore not available). Panel D brings the baseline values of the socio-emotional dimensions investigated, and Panel E the financial education baseline variables. Note that dimensions measured by a set of questions are assessed through indices generated by principal component analysis (pca).

Table 26: Baseline Balance - Non-Attritors in LM Skills Survey Mar/22

	Control	Treatment	Diff. (T-C)	p-value
Panel A: Background characteristics				
Age	14.93	14.94	0.01	0.99
Male	0.45	0.44	-0.01	0.74
White	0.30	0.28	-0.02	0.10
Socioeconomic Index (index, pca)	0.14	0.15	0.00	0.50
Panel B: Educational controls				
Always studied in public school	0.72	0.68	-0.04	0.66
Never failed a grade	0.89	0.88	-0.01	0.85
Afternoon shift	0.57	0.59	0.01	0.84
Self-management (Senna index)	-0.04	-0.11	-0.07	0.48
Negative-emotion resilience (Senna index)	-0.41	-0.46	-0.05	0.32
Panel C: Baseline educational outcomes				
Math Grade in 2020	7.52	7.39	-0.12	0.34
Desires to finish high-school	0.96	0.94	-0.01	0.28
Study strategy in math (index, pca)	-0.05	-0.03	0.02	0.52
Engagement in math (index, pca)	-0.00	0.02	0.02	0.40
Panel D: Baseline socioemotional outcomes				
Growth mindset (index, pca)	-0.04	-0.01	0.04*	0.05
Grit (index, pca)	0.12	0.03	-0.10	0.15
Inner locus of control (index, pca)	0.70	0.69	-0.01	0.42
Panel E: Baseline financial educ. outcomes				
Financial literacy test score (perc.)	0.63	0.64	0.01	0.61
Financial Behavior (index, pca)	-0.02	-0.03	-0.02	0.65

Note: Significance levels (*10%; **5%; ***1%) are captured through OLS estimation considering school pairs fixed effects and accounting for clustered (school pairs) standard errors. F-test of joint significance: 1.098, not statistically significant. Panels A and B comprise the control variables to be explored to increase the precision of the estimates, measuring characteristics related to the socioeconomic and academic background of the students. Panel C shows the baseline values for the outcomes of mathematics attainment and engagement (SAEGO is only applied at the end of the 9th grade and is therefore not available). Panel D brings the baseline values of the socio-emotional dimensions investigated, and Panel E the financial education baseline variables. Note that dimensions measured by a set of questions are assessed through indices generated by principal component analysis (pca).

Table 27: Baseline Balance - Non-Attritors in Survey 2022

	Control	Treatment	Diff. (T-C)	p-value
Panel A: Background characteristics				
Age	14.90	14.94	0.04	0.31
Male	0.45	0.44	-0.01	0.86
White	0.29	0.27	-0.02	0.34
Socioeconomic Index (index, pca)	0.20	0.09	-0.11	0.31
Panel B: Educational controls				
Always studied in public school	0.73	0.70	-0.03	0.72
Never failed a grade	0.91	0.88	-0.03	0.19
Afternoon shift	0.55	0.58	0.03	0.74
Self-management (Senna index)	-0.02	-0.09	-0.07	0.51
Negative-emotion resilience (Senna index)	-0.36	-0.45	-0.09	0.10
Panel C: Baseline educational outcomes				
Math Grade in 2020	7.57	7.41	-0.15	0.45
Desires to finish high-school	0.96	0.94	-0.02	0.40
Study strategy in math (index, pca)	-0.08	-0.04	0.05	0.24
Engagement in math (index, pca)	0.03	0.08	0.05	0.15
Panel D: Baseline socioemotional outcomes				
Growth mindset (index, pca)	-0.01	-0.01	-0.01	0.15
Grit (index, pca)	0.18	0.05	-0.13*	0.07
Inner locus of control (index, pca)	0.71	0.70	-0.01	0.27
Panel E: Baseline financial educ. outcomes				
Financial literacy test score (perc.)	0.63	0.64	0.01	0.97
Financial Behavior (index, pca)	-0.03	-0.01	0.03	0.83

Note: Significance levels (*10%; **5%; ***1%) are captured through OLS estimation considering school pairs fixed effects and accounting for clustered (school pairs) standard errors. F-test of joint significance: 1.645*, statistically significant at 10%. Panels A and B comprise the control variables to be explored to increase the precision of the estimates, measuring characteristics related to the socioeconomic and academic background of the students. Panel C shows the baseline values for the outcomes of mathematics attainment and engagement (SAEGO is only applied at the end of the 9th grade and is therefore not available). Panel D brings the baseline values of the socio-emotional dimensions investigated, and Panel E the financial education baseline variables. Note that dimensions measured by a set of questions are assessed through indices generated by principal component analysis (pca).

Table 28: Baseline Balance - Non-Attritors in Exam 2022

	Control	Treatment	Diff. (T-C)	p-value
Panel A: Background characteristics				
Age	14.90	14.93	0.03	0.38
Male	0.46	0.45	-0.01	0.91
White	0.29	0.28	-0.01	0.27
Socioeconomic Index (index, pca)	0.23	0.18	-0.05	0.34
Panel B: Educational controls				
Always studied in public school	0.72	0.68	-0.04	0.86
Never failed a grade	0.90	0.88	-0.02	0.28
Afternoon shift	0.57	0.59	0.02	0.74
Self-management (Senna index)	0.00	-0.11	-0.11	0.24
Negative-emotion resilience (Senna index)	-0.37	-0.45	-0.07	0.32
Panel C: Baseline educational outcomes				
Math Grade in 2020	7.56	7.41	-0.15	0.14
Desires to finish high-school	0.96	0.95	-0.02	0.47
Study strategy in math (index, pca)	-0.07	-0.04	0.03	0.41
Engagement in math (index, pca)	0.04	0.04	0.01	0.33
Panel D: Baseline socioemotional outcomes				
Growth mindset (index, pca)	-0.04	-0.01	0.02**	0.03
Grit (index, pca)	0.20	0.04	-0.16*	0.07
Inner locus of control (index, pca)	0.71	0.70	-0.01	0.59
Panel E: Baseline financial educ. outcomes				
Financial literacy test score (perc.)	0.64	0.64	0.00	0.67
Financial Behavior (index, pca)	-0.06	-0.02	0.04	0.54

Note: Significance levels (*10%; **5%; ***1%) are captured through OLS estimation considering school pairs fixed effects and accounting for clustered (school pairs) standard errors. F-test of joint significance: 1.546*, statistically significant at 10%. Panels A and B comprise the control variables to be explored to increase the precision of the estimates, measuring characteristics related to the socioeconomic and academic background of the students. Panel C shows the baseline values for the outcomes of mathematics attainment and engagement (SAEGO is only applied at the end of the 9th grade and is therefore not available). Panel D brings the baseline values of the socio-emotional dimensions investigated, and Panel E the financial education baseline variables. Note that dimensions measured by a set of questions are assessed through indices generated by principal component analysis (pca).

Table 29: Baseline Balance - Non-Attritors in Math Grades 2022

	Control	Treatment	Diff. (T-C)	p-value
Panel A: Background characteristics				
Age	14.93	14.94	0.02	0.79
Male	0.45	0.45	0.00	0.91
White	0.29	0.27	-0.02	0.22
Socioeconomic Index (index, pca)	0.19	0.15	-0.04	0.49
Panel B: Educational controls				
Always studied in public school	0.72	0.68	-0.04	0.85
Never failed a grade	0.90	0.88	-0.02	0.28
Afternoon shift	0.56	0.60	0.04	0.51
Self-management (Senna index)	-0.04	-0.12	-0.08	0.31
Negative-emotion resilience (Senna index)	-0.38	-0.45	-0.07	0.26
Panel C: Baseline educational outcomes				
Math Grade in 2020	7.52	7.38	-0.15	0.16
Desires to finish high-school	0.96	0.94	-0.01	0.50
Study strategy in math (index, pca)	-0.07	-0.04	0.04	0.29
Engagement in math (index, pca)	0.02	0.04	0.02	0.26
Panel D: Baseline socioemotional outcomes				
Growth mindset (index, pca)	-0.03	-0.02	0.01*	0.09
Grit (index, pca)	0.15	0.02	-0.13*	0.05
Inner locus of control (index, pca)	0.71	0.69	-0.01	0.28
Panel E: Baseline financial educ. outcomes				
Financial literacy test score (perc.)	0.63	0.64	0.00	0.74
Financial Behavior (index, pca)	-0.02	-0.02	0.00	0.91

Note: Significance levels (*10%; **5%; ***1%) are captured through OLS estimation considering school pairs fixed effects and accounting for clustered (school pairs) standard errors. F-test of joint significance: 1.942**, statistically significant at 5%. Panels A and B comprise the control variables to be explored to increase the precision of the estimates, measuring characteristics related to the socioeconomic and academic background of the students. Panel C shows the baseline values for the outcomes of mathematics attainment and engagement (SAEGO is only applied at the end of the 9th grade and is therefore not available). Panel D brings the baseline values of the socio-emotional dimensions investigated, and Panel E the financial education baseline variables. Note that dimensions measured by a set of questions are assessed through indices generated by principal component analysis (pca).

Table 30: Baseline Balance - Non-Attritors in SAEGO 2022

	Control	Treatment	Diff. (T-C)	p-value
Panel A: Background characteristics				
Age	14.90	14.93	0.03	0.38
Male	0.46	0.45	-0.01	0.91
White	0.29	0.28	-0.01	0.26
Socioeconomic Index (index, pca)	0.23	0.18	-0.05	0.34
Panel B: Educational controls				
Always studied in public school	0.72	0.68	-0.04	0.86
Never failed a grade	0.90	0.88	-0.02	0.28
Afternoon shift	0.57	0.59	0.02	0.74
Self-management (Senna index)	0.00	-0.11	-0.11	0.23
Negative-emotion resilience (Senna index)	-0.37	-0.45	-0.08	0.32
Panel C: Baseline educational outcomes				
Math Grade in 2020	7.56	7.41	-0.15	0.14
Desires to finish high-school	0.96	0.95	-0.02	0.47
Study strategy in math (index, pca)	-0.07	-0.04	0.03	0.41
Engagement in math (index, pca)	0.04	0.04	0.01	0.33
Panel D: Baseline socioemotional outcomes				
Growth mindset (index, pca)	-0.04	-0.01	0.02**	0.04
Grit (index, pca)	0.20	0.04	-0.16*	0.07
Inner locus of control (index, pca)	0.71	0.70	-0.01	0.59
Panel E: Baseline financial educ. outcomes				
Financial literacy test score (perc.)	0.64	0.64	0.00	0.66
Financial Behavior (index, pca)	-0.06	-0.02	0.04	0.53

Note: Significance levels (*10%; **5%; ***1%) are captured through OLS estimation considering school pairs fixed effects and accounting for clustered (school pairs) standard errors. F-test of joint significance: 1.545*, statistically significant at 10%. Panels A and B comprise the control variables to be explored to increase the precision of the estimates, measuring characteristics related to the socioeconomic and academic background of the students. Panel C shows the baseline values for the outcomes of mathematics attainment and engagement (SAEGO is only applied at the end of the 9th grade and is therefore not available). Panel D brings the baseline values of the socio-emotional dimensions investigated, and Panel E the financial education baseline variables. Note that dimensions measured by a set of questions are assessed through indices generated by principal component analysis (pca).

Table 31: Baseline Balance - Non-Attritors in LM Skills Survey Nov/2022

	Control	Treatment	Diff. (T-C)	p-value
Panel A: Background characteristics				
Age	14.90	14.94	0.04	0.31
Male	0.45	0.44	-0.01	0.78
White	0.29	0.28	-0.02	0.30
Socioeconomic Index (index, pca)	0.19	0.09	-0.11	0.31
Panel B: Educational controls				
Always studied in public school	0.73	0.70	-0.03	0.84
Never failed a grade	0.91	0.88	-0.03	0.17
Afternoon shift	0.55	0.58	0.03	0.69
Self-management (Senna index)	-0.02	-0.09	-0.07	0.54
Negative-emotion resilience (Senna index)	-0.36	-0.44	-0.08	0.14
Panel C: Baseline educational outcomes				
Math Grade in 2020	7.56	7.41	-0.15	0.43
Desires to finish high-school	0.96	0.94	-0.02	0.40
Study strategy in math (index, pca)	-0.08	-0.04	0.04	0.33
Engagement in math (index, pca)	0.04	0.07	0.04	0.19
Panel D: Baseline socioemotional outcomes				
Growth mindset (index, pca)	-0.01	-0.01	0.00	0.12
Grit (index, pca)	0.18	0.05	-0.13*	0.07
Inner locus of control (index, pca)	0.71	0.70	-0.01	0.22
Panel E: Baseline financial educ. outcomes				
Financial literacy test score (perc.)	0.63	0.64	0.01	0.94
Financial Behavior (index, pca)	-0.04	-0.01	0.03	0.87

Note: Significance levels (*10%; **5%; ***1%) are captured through OLS estimation considering school pairs fixed effects and accounting for clustered (school pairs) standard errors. F-test of joint significance: 1.727**, statistically significant at 5%. Panels A and B comprise the control variables to be explored to increase the precision of the estimates, measuring characteristics related to the socioeconomic and academic background of the students. Panel C shows the baseline values for the outcomes of mathematics attainment and engagement (SAEGO is only applied at the end of the 9th grade and is therefore not available). Panel D brings the baseline values of the socio-emotional dimensions investigated, and Panel E the financial education baseline variables. Note that dimensions measured by a set of questions are assessed through indices generated by principal component analysis (pca).

Appendix C

This appendix section provides a comprehensive list of all math skills evaluated by the SAEGO exam, categorized into program-specific and non-program-specific skills as identified in our analysis.

C.1 Program-specific math skills

1. Solve problems involving natural numbers with different operational meanings (addition, subtraction, multiplication, division, exponentiation).
2. Identify fractions that can be associated with different meanings.
3. Solve problems involving percentages.
4. Solve problems using relationships between different units of measurement.
5. Perform calculations involving operations with rational numbers (addition, subtraction, multiplication, division, exponentiation).
6. Identify a first-degree equation or inequality that expresses a problem.
7. Solve problems involving second-degree equations.
8. Associate information presented in lists and/or simple tables with the graphs representing them and vice versa.
9. Solve problems involving direct or inverse proportional variation between quantities.
10. Identify similar figures through recognition of proportionality relationships.
11. Identify equivalent fractions.
12. Solve problems with rational numbers involving operations (addition, subtraction, multiplication, division, exponentiation).
13. Solve problems involving information presented in tables and/or graphs.
14. Calculate the numerical value of an algebraic expression.
15. Solve problems with integers involving operations (addition, subtraction, multiplication, division, exponentiation).
16. Identify a system of first-degree equations that expresses a problem.
17. Identify the relationship between algebraic and geometric representations of a system of first-degree equations.

C.2 Non-program-specific math skills

1. Identify relationships between quadrilaterals through their properties.
2. Locate real numbers on the number line.
3. Recognize conservation or modification of side measurements, perimeter, area in the enlargement/reduction of polygonal figures using grid meshes.
4. Identify the location/movement of objects on maps, sketches, and other graphic representations.
5. Identify different representations of the same rational number.
6. Solve problems involving the calculation of the perimeter of plane figures.
7. Identify common properties and differences between two-dimensional and three-dimensional figures, relating them to their flat developments.
8. Solve problems involving the calculation of the area of plane figures.
9. Recognize angles as changes in direction or turns, identifying right and non-right angles.
10. Recognize the circle/circumference, its elements, and some of their relationships.
11. Identify the algebraic expression that expresses a regularity observed in sequences of numbers or figures (patterns).
12. Solve problems involving the total area and/or volume of a solid (prism, pyramid, cylinder, cone, sphere).
13. Use metric relations of the right triangle to solve meaningful problems.
14. Solve problems using properties of polygons (sum of their internal angles, number of diagonals, calculation of each internal angle in regular polygons).
15. Interpret information presented through Cartesian coordinates.
16. Recognize decimal representations of rational numbers as an extension of the decimal numbering system, identifying "orders" such as tenths, hundredths, and thousandths.
17. Perform calculations with integers, involving operations (addition, subtraction, multiplication, division, exponentiation).
18. Identify properties of triangles by comparing measurements of sides and angles.
19. Perform simple calculations with approximate values of radicals.

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