Proceeding Series of the Brazilian Society of Computational and Applied Mathematics, v. 11, n. 1, 2025.

Trabalho apresentado no XLIII CNMAC, Centro de Convenções do Armação Resort - Porto de Galinhas - PE, 2024

Proceeding Series of the Brazilian Society of Computational and Applied Mathematics

New Approach of Mathematical Learning after Covid-19: Applications with Basic Operations at Domingos Costa Teobaldo School

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Absctract.

This article takes a look at restoring learning in mathematics through a proposal to teach basic arithmetic operations in a 9th-grade class at the Domingos Costa Teobaldo School in the municipality of Aracati-CE. This work proposes some actions to be shared among teachers who work in math teaching and face the challenge of recomposing the learning that classes require after the COVID-19 pandemic. The methodology used was to apply the teaching proposal with the school's 9th graders over sixteen meetings, using some teaching resources.

Keywords. Math teaching, new methodologies, Covid-19.

1 Introduction

This article presents a study of education contextualized with the social reality of the student, which is a very interesting factor that has come to the fore as a necessary educational concern in Brazil, especially since the work of the illustrious professor Ubiratan D'Ambrosio, who states that "Mathematics is the only school subject that is taught in approximately the same (traditional) way and with the same content to all children in the world" [5]. "Knowing how to teach is not transferring knowledge, but creating the possibilities for its own production or construction" [6]. Based on this premise, difficulties in learning mathematics do not only affect the student, but also the teacher. Many scholars have long tried to deconstruct the idea that mathematics is a difficult subject that can only be learned by those born with a talent for it. The discussion around this belief and the effort to overcome it have challenged many teachers. Even with much effort, mathematics is still the villain in educational institutions because, as the National Curriculum Parameters (PCN) have already warned, teachers often present content, definitions, examples, and demonstrations for students to practice through repetition, assuming that reproduction generates learning [2]. Based on this background, this work proposes an approach to the basic arithmetic operations of

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mathematics in a 9th-grade class based on the need for these operations to be of fundamental importance for learning more complex mathematical skills in the final grade of elementary school.

This article aims to provide guiding material for mathematics teachers that will be useful in their daily classroom practice with some proposals that are a little different if we compare them with the regular teaching seen until 2019, which aims to benefit teaching by making student learning more meaningful, emphasizing their mathematical thinking. In this way, our general objective is to present an approach to teaching basic arithmetic operations through the recomposition of mathematical learning for students in the 9th grade of elementary school. The main objectives of the research were to address the recomposition of learning and its specificities. In this way, it was possible to obtain relevant data that shows the need to use the recomposition of mathematical learning and offer a teaching proposal with an approach to the basic arithmetic operations of mathematics.

1.1 The SPAECE Evaluation and Diagnostic Results

Created in 1992, the Permanent System for the Assessment of Basic Education in Ceará (SPAECE) assesses the skills and abilities of primary and secondary school students in the state and municipal schools in Portuguese and Mathematics. Aligned with the Basic Education Assessment System (SAEB), SPAECE has its own reference matrix, and monitoring identifies the level of proficiency and the evolution of student performance in order to subsidize educational policies. According to [3], the first edition of SPAECE, 30 years ago, covered only the capital, Fortaleza, where it reached 14600 students in grades 4 to 8 from 157 state schools. It was only in 2003 that the assessment reached all of Ceará's municipalities for the first time, with a total of 28,500 students in the 8th grade of elementary school and the 3rd grade of high school. This educational policy has been greatly strengthened by the cooperation system between states and municipalities, with SPAECE as one of the tools for monitoring and setting new learning targets. In Ceará, therefore, we see a case in which assessment results are used as an ally of managers in implementing and monitoring educational policies aimed at improving the quality of the education offered and, therefore, guaranteeing the right to learning. Due to the social distancing caused by the COVID-19 pandemic, the SPAECE assessment was not carried out and applied in 2020 and 2021. However, in the 2022 school year, this assessment also returned with the resumption of face-to-face teaching. In particular, it was applied in two versions and at different times during that academic year. The first version of the SPAECE with a different objective, classified as the main diagnostic assessment of basic education in Ceará in 2022, was carried out to contribute to appropriate actions to combat learning losses in the pandemic period, carried out at the beginning of the school year, namely in March, with the main objective of diagnosing and verifying students' prior knowledge, allowing teachers and specialists to review planning and adapt teaching strategies to the needs of classes and students. The second version of the SPAECE was carried out at the end of the school year, as in previous years.

1.2 Recomposing Mathematical Learning

In [7] presents the concept of recomposing learning based on Sonia Guaraldo, who says it is "a big umbrella that involves looking at multiple aspects." In the period of return to face-to-face teaching, post-remote teaching, many things have changed because it wasn't enough to return things to the way they were since it will be necessary to do better, and for these reasons, recomposition is essential. In this way, it would be necessary to look at the various aspects, such as the skills that still need to be consolidated, so that teachers can build learning strategies to recompose these aspects. One question: is there a difference between remediation and recovery? Recovery is an appropriate term when we are referring to a situation in which the subject has had

DOI: 10.5540/03.2025.011.01.0445

the opportunity to learn, i.e., the school has somehow worked on these skills with the student and sought to develop them. On the other hand, recomposition refers to learning what was not possible, i.e., recovering what was not learned is impossible. "For this reason, the term 'recomposition' has been adopted, in the sense of 're-establishing,' 'restoring' the connection with the student, which had been lost through social isolation" [1]. According to [1], remedial teaching practices have a vision for what was worked on, in the sense of trying to recover what the students were unable to learn, while remediation should provide comprehensive learning of what was lost; in other words, they should be made possible to ensure the building of prior knowledge that helps in the development of "competencies, skills, and attitudes related to the school year in which they are enrolled, boosting learning." For remediation to occur properly, a diagnostic assessment would be needed so that teachers can identify the gaps and plan the support needed, both in the pedagogical actions of remediation and remediation [1].

1.2.1 About Basic Operations

The four operations are part of the curriculum in the early years of elementary school as one of the most essential pieces of content, and the study of their first ideas begins in kindergarten. According to the National Curriculum Parameters, Elementary School I is divided into two cycles, the first cycle consisting of the 1st and 2nd grades (currently the 2nd and 3rd grades), and the second cycle consisting of the 3rd and 4th grades (currently the 4th and 5th grades). The 5th grade acts as a transition to the 6th grade, which is the beginning of Elementary School II. At the end of each cycle, students need to have acquired the necessary skills and abilities to enter the next phase.

2 Methodology

2.1 The Research

This research was based on educational data from the Domingos Costa Teobaldo School, referring to the SPAECE assessments and the Mais Paic Protocol, which indicate students' learning and math proficiency rates in the 9th grade of elementary school.

2.2 Research Locus

The research took place at the Domingos Costa Teobaldo Municipal School, located in the municipality of Aracati/CE. The school is located 17 kilometers from the city of Aracati and 160 kilometers from the capital Fortaleza. Its address is Vila de Santa Tereza, zona rural, s/n. The Domingos Costa Teobaldo School currently has a good structure with 10 classrooms, 01 library room, 01 secretariat, 01 computer room, 01 pedagogical coordination room, 02 pedagogical support room, 01 canteen, 01 kitchen, 01 pantry, 04 bathrooms, 01 male, 01 female and 02 unisex, 04 circulation areas and 01 covered court.

2.3 Research Subjects

The research was carried out with 30 of the 31 students enrolled in the 9th grade class, as, unfortunately, one of the students dropped out during the 2022 school year. As it was the only 9th-grade class at the school during the school year in which the research was carried out, it was chosen because it is the class in the final years of primary school representing the school in the SPAECE assessment.

DOI: 10.5540/03.2025.011.01.0445

2.4 Procedures

To carry out this study, weekly meetings were planned and held on Thursdays with one 50-minute class each, between June and November 2022, during the weeks that classes were held at the institution during the research. The meetings were held in the afternoon, the same shift as the class's regular lessons, except for one moment in the morning when the 1st School Mental Calculation Olympiad was held. The proposal was only possible due to the planning agreed between the teacher and school management, in which a weekly lesson was set aside from the seven weekly math lessons offered to the class to develop the project and alleviate the gap in mathematical learning. The assessment of student learning carried out during the research will be a continuous and cumulative process involving curricular content and activities developed inside and outside the school environment, with qualitative aspects prevailing over quantitative ones.

3 Results

3.1 Results of Diagnostics I and II on Basic Operations

Diagnostic I was designed and composed of 4 accounts of each of the four basic operations according to the class level, applied on June 21, 2022 in [4]. Diagnostic II was applied on November 24, 2022, and consisted of two questions. The first consisted of a few items with basic operations to set up and solve, while the second question consisted of a few items of problem situations involving basic operations in [4].

Below are the results obtained and represented in Figure 1.

- Previously, 38.7% mastered all the operations, now, 70%;
- Previously, 9.6% had mastered addi.tion, subtraction, and multiplication, now 27%;
- Before 25.8% mastered addition and subtraction, now 3.0%;
- Before 22.5% mastered only addition, now 0%;
- Previously, 6.4% had not mastered any operation, now 0%.

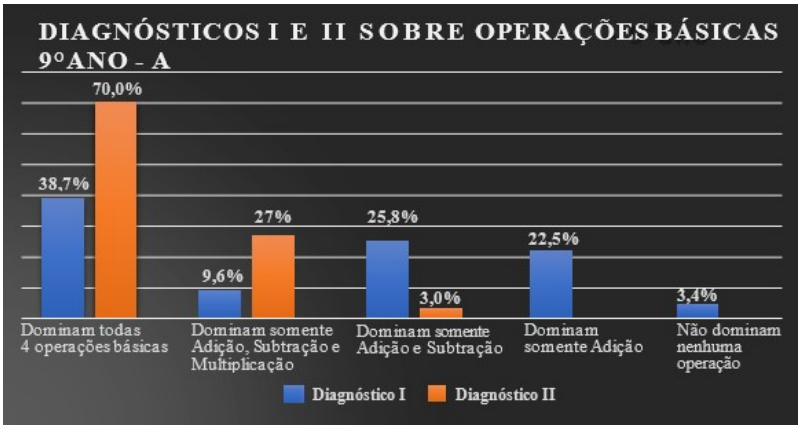

Figure 1: Comparison of Results in Diagnoses I and II. Source: Own.

3.2 The Protocol Results

The MAIS PAIC Protocol consisted of 26 items. It was drawn up by Mais Paic researchers from the Ceará State Department of Education. Approached by 17 descriptors, all the items that made up the protocol aimed to assess students' mathematical learning concerning specific mathematical skills belonging to the SPAECE 9th-grade math reference matrix. The 871 students from the Aracati municipal school system took part, 28 of them from the Domingos Costa Teobaldo school, both 9th graders. The Mais Paic Protocol was applied on September 6, 2022, throughout Aracati's municipal school system and took one hour to complete. The results were published on [4].

3.3 Spaece 2022 Preliminary Results - (9th grade)

The SPAECE assessment comprises 52 items, 26 aimed at assessing Portuguese language learning and another 26 at assessing mathematical learning. Specifically regarding the mathematics items, they all aim to assess student learning of specific mathematical skills belonging to Spaece's 9th-grade mathematics reference matrix. The SPAECE 2022 for the 9th grade was administered on December 1, 2022, in all municipal schools in Ceará. It took two hours and 10 minutes to complete, with an average time of approximately one hour for each area of knowledge assessed in [4]. The results were published on [4].

3.4 Discussions

The following are discussions of the results obtained in figures 5 and 6 found on [4]. The average score obtained by the municipal network, as shown in Figure 5 on [4], is 40.70%, which is considered low given that it refers to a diagnosis applied in the third bimester of the 2022 school year. The Domingos Costa Teobaldo school's performance was 45.60%. This average percentage of correct answers was the second highest among the average results obtained by the schools in the network. On the other hand, Figure 6 in [4] shows the percentage of correct answers per descriptor assessed in the protocol obtained by the municipal network. It shows that only four of the 17 descriptors assessed have yields above 50%, namely D07, D12, D65, and D75. The others have yields below 50%, with D24 standing out as having the lowest yield of 17.07%.

4 Final Considerations

When the research work began, it was found that many students had difficulties performing simple basic arithmetic operations, even more so when trying to develop problem-solving involving such operations, especially multiplication, and division, which is why it was important to use the recomposition of mathematical learning addressing basic operations. Given the above, the main purpose of the research was to present a didactic proposal to strengthen the learning of the basic arithmetic operations of mathematics through recomposition to facilitate the learning of more complex mathematical skills in the 9th grade of elementary school. It can be seen, therefore, that the purpose and/or general objective was achieved because, effectively, the work was able to verify that, for the most part, the students involved in the research did not have full mastery of performing or applying the basic operations in problem situations, but, at the end of the meetings developed and proposed, this strengthening in learning was verified, as shown in the results. The specific objectives were also achieved as we defined learning recovery and presented its specificities. Relevant data that shows the need to use the recomposition of learning was presented, and a teaching proposal was developed and presented in detail in this work with an approach to the basic arithmetic operations of mathematics from the perspective of the recomposition of learning. The results show a positive contribution in learning the basic operations, especially multiplication

DOI: 10.5540/03.2025.011.01.0445

and division, which allow for a better progression of the subjects that require these bases. In this way, the recomposition of mathematical learning can be used as a strategy by teachers that aims to ease or even remedy students' difficulties without becoming repetitive in points that generate difficulties in learning.

Acknowledgements

This article was supported by Comissão de Aperfeiçoamento de Pessoal do Nível Superior (CAPES) and Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq).

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