

Aspects of Computational Thinking observed in problem-solving in 6th grade Mathematics textbooks of Middle School

Abstract: The research observed how aspects of Computational Thinking manifest themselves in problem-solving in sixth-grade Mathematics textbooks, considering that these materials are among the most used by Basic Education teachers. For this analysis, the concept of Computational Thinking in Mathematics Education was adopted. Thus, characteristics aligned with Computational Thinking were identified both in activities similar to the questions covered in the textbooks and in the activities solved by the students, which highlights the possibility of designing teaching methodologies that integrate Computational Thinking into the activities presented in these materials.

Keywords: Computational Thought. Mathematical Education. Textbook. Middle School. Problem Solving.

Aspectos del Pensamiento Computacional observados en la resolución de problemas en los libros de texto de Matemáticas de 6to grado de la Secundaria

Resumen: La investigación observó cómo aspectos del Pensamiento Computacional se manifiestan en la solución de problemas presentes en los libros de texto de Matemática de 6º grado de la Enseñanza Primaria, considerando que estos materiales se encuentran entre los más utilizados por los docentes de Educación Básica. Para este análisis se adoptó el concepto de Pensamiento Computacional en Educación Matemática. Así, se identificaron características alineadas con el Pensamiento Computacional tanto en actividades similares a las preguntas abordadas en los libros de texto como en actividades resueltas por los estudiantes, lo que destaca la posibilidad de diseñar metodologías de enseñanza que integren el Pensamiento Computacional en las actividades presentadas en estos materiales.

Palabras clave: Pensamiento Computacional. Educación Matemática. Libro de Texto. Secundaria. Resolución de Problemas.

Aspectos do Pensamento Computacional observados na resolução de problemas presentes em livros didáticos de Matemática do 6º ano do Ensino Fundamental

Resumo: A pesquisa observou como os aspectos do Pensamento Computacional se manifestam na resolução de problemas presentes nos livros didáticos de Matemática do 6º ano do Ensino Fundamental, considerando que esses materiais figuram entre os mais utilizados por professores da Educação Básica. Para essa análise, adotou-se o conceito de Pensamento Computacional na Educação Matemática. Assim, foram identificadas características alinhadas ao Pensamento Computacional tanto nas atividades similares às questões que contemplam os livros didáticos quanto nas atividades resolvidas pelos estudantes, o que evidencia a possibilidade de se traçarem metodologias de ensino que integrem o Pensamento Computacional às atividades apresentadas nesses materiais.

Palavras-chave: Pensamento Computacional. Educação Matemática. Livro Didático. Ensino

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Received • 16/09/2024

Accepted • 25/03/2025

Published • 14/06/2025

Editor • Gilberto Januario 

ARTICLE

Fundamental. Resolução de Problemas.

1 Introduction

In recent years, Digital Information and Communication Technologies (DICT) have become part of the habits and customs of the Brazilian population. Digital applications used in everyday activities and the use of social networks for leisure and entertainment are examples that illustrate this scenario. According to the *Base Nacional Comum Curricular* [National Common Curriculum Base — BNCC] (Brazil, 2017), digital culture has fostered significant social changes in contemporary society, with young people as the protagonists of these changes.

In the educational field, Valente (2014) emphasizes the importance of providing students with learning environments that enable the understanding and construction of knowledge. In this sense, the use of DICT can be extremely useful as a cognitive tool, playing different roles. Networked technology and digital skills are essential elements for a comprehensive education. Students without digital skills miss out on the opportunity to access important materials for their learning. Furthermore, there is the visibility that access to information and digital communication brings to the individual, providing the opportunity to express their ideas and the chance of employability in the future (Moran, 2018, p. 11).

However, despite the potential of DICT, data from the 2023 School Census, released by the National Institute of Studies and Educational Research Anísio Teixeira (INEP), show that 62% of Middle School students are enrolled in the municipal education system. However, only 39.6% of these schools have desktop computers, 36.7% provide internet access to students, and 58.8% have a multimedia projector (INEP, 2024).

Therefore, considering the social contrasts that generate such distinct realities among Brazilian schools, we proposed to investigate how Computational Thinking can contribute to the teaching and learning processes of Mathematics, mainly through problem-solving in unplugged activities — those that do not require the mediation of digital tools. The choice of this approach seeks to respond to the structural limitations observed and, at the same time, explore the conceptual potential of Computational Thinking as a teaching strategy.

In this sense, this research sought to analyze how the precepts of Computational Thinking can be observed in the resolution of problems that are included in the Mathematics textbooks of the municipal education network of Juiz de Fora, Brazil. It also sought to understand how these aspects are evident in the process of production of meanings by students during the resolution of these activities, considering the specificities of the school context in which they are inserted.

2 Computational Thinking

In the late 1960s, philosopher and mathematician Seymour Papert developed a learning theory called *Constructionism*, pioneering the introduction of computers into education and creating the Logo language. Since the creation of this language, there have been extensive discussions about *how* and *why* to introduce computing into Basic Education in numerous countries. As one of the main thinkers on the influence of technology on learning, Papert is considered the precursor of Computational Thinking (Pasqual Júnior, 2020).

In 2006, the term *Computational Thinking* emerged in the article of the same name, by Jeanette Wing. According to the author, computational thinking involves the ability to solve problems, design systems and understand human behavior, based on *fundamental concepts for computing*. In this work, Wing presents the main characteristics of computational thinking:

- conceptualize, not program;

- fundamental, not mechanical, skill;
- a way humans think, not computers;
- complements mathematical and engineering thinking;
- composed of ideas, not just software or hardware;
- for everyone, everywhere (Wing, 2006, p. 3-4).

Wing's article opened up numerous research possibilities aimed at conceptualizing and developing Computational Thinking. In the K-12 report, prepared by the *Computer Science Teachers Association* (CSTA) in 2011, Computational Thinking is characterized as a problem-solving methodology that can associate Computer Science with all disciplines, providing a distinct means of analyzing and developing solutions to problems that can be solved computationally.

Brackmann (2017) emphasizes that Computational Thinking uses four pillars to achieve its main objective, which is problem-solving. They are:

- *decomposition*: consists of identifying a complex problem and breaking it down into smaller, more manageable pieces;
- *pattern recognition*: based on the in-depth and individual analysis of these fragmented problems, identifying similar problems that have already been solved previously;
- *abstraction*: focuses on relevant details, disregarding information that is not important for the resolution;
- *algorithms*: simple rules designed to solve the subproblems found.

In the 2019 guidelines of the *Sociedade Brasileira de Computação* [Brazilian Computer Society — SBC] for teaching Computing in Basic Education, Computational Thinking refers to “the ability to understand, define, model, compare, solve, automate and analyze problems in a methodical and systematic way, through the construction of algorithms” (SBC, 2019, p. 6).

In the BNCC (Brazil, 2017), the term Computational Thinking is mentioned, within the scope of Mathematics and its Technologies, as a skill to be developed considering the learning of algorithmic language and algebraic language, aiming at problem-solving. However, there is no didactic-methodological indication that directs how Basic Education teachers can develop Computational Thinking in the classroom.

In 2022, the National Education Council — CNE published the CNE/CEB Opinion no. 2, which established a complement to the BNCC, known as BNCC Computing, which establishes learning objectives for all stages of schooling in Basic Education, according to the thematic axes Computational Thinking, Digital World and Digital Culture. The document highlights that Computational Thinking,

refers to the ability to understand, analyze, define, model, solve, compare and automate problems and their solutions in a methodical and systematic way, through the development of the ability to create and adapt algorithms, applying computing fundamentals to leverage and improve learning and creative and critical thinking in different areas of knowledge (Brasil, 2022a, p. 14).

Following the aforementioned opinion, CNE Resolution No. 1/2022¹ defined standards on Computing in Basic Education. It reiterates that computer teaching must consider the skills

¹ Available at <http://portal.mec.gov.br/docman/outubro-2022-pdf/241671-rceb001-22/file>

provided for in the BNCC and that curriculum formulation must address the skills set out in the BNCC Computing. In addition, the resolution addresses guidelines for initial and continuing teacher training.

3 Computational Thinking in Mathematics Education

In recent years, the National Curriculum Guidelines and other legal provisions regulating Education in Brazil have sought to structure programs, projects, and actions aimed at innovation and technology in Education. In this scenario, it is necessary to develop teaching methodologies that articulate the skills required for teaching Computing in Basic Education with the skills developed in normative disciplines.

Silva and Meneghetti (2019) emphasize that research on Computational Thinking, within the scope of Mathematics, mainly addresses themes that focus on teaching and learning processes, through the implementation of activities that use tools such as *Scratch* and unplugged computing.

Navarro and Sousa (2023) analyzed the logical-historical movement of the term *Computational Thinking* through theses, dissertations, and scientific articles published between 2009 and 2019, from the BNCC and the Curriculum of the state of São Paulo, Brazil. In this study, they found that most of the research was based on the definition of Computational Thinking by the author Jeannette Wing, that is, they sought precepts from computing and programming to define Computational Thinking. Thus, they concluded that there is no concept or proposals for actions that can contribute to Mathematics teachers on how to develop Computational Thinking in the classroom.

The analysis of this research allowed the authors, considering the assumptions of the Historical-Cultural Theory, to determine three conceptual links of Computational Thinking in the context of Mathematics Education: problem solving, algebraic thinking, and algorithmic thinking. Thus, they outlined some characteristics of these conceptual links (external links), aiming at Computational Thinking. In the context of problem solving, Navarro and Sousa (2023) emphasize that this process involves several essential steps:

- a) reading and interpreting the problem, aiming at the process of identifying the information present in the activity statement;
- b) decomposing the problem, that is, analyzing and summarizing the information provided, with a view to systematizing ideas;
- c) raising hypotheses, mobilizing knowledge to develop possibilities and test conjectures;
- d) developing a resolution strategy, which includes using the strategy, that is, making a decision;
- e) reflecting on the resolution, promoting a critical analysis of the process used and the results obtained (p. 130).

Furthermore, they emphasize that algebraic thinking is characterized by:

- a) production and use of algebraic models (representations);
- b) construction and use of algebraic structures and procedures such as algorithms, rules, symbols, unknowns, measurements, numbers, properties of operations, sequence, etc.;
- c) operationalization of algebraic language (for example, algebraic expressions, written records, diagrams, pattern recognition, etc.) (Navarro and Sousa, 2023, p. 135).

They also emphasize that algorithmic thinking, within the scope of Computational Thinking, presents the following specificities:

- a) decomposition;
- b) recognition of regularities;
- c) generalization and abstraction;
- d) algorithmic language (Navarro and Sousa, 2023, p. 146).

According to the authors, these three conceptual links establish an interdependence that allows Computational Thinking to be defined in the context of Mathematics Education as a dialectical movement of thought. This process guides students to interpret, analyze, question, explore, investigate, decompose, reflect, observe regularities and produce syntheses, enabling the construction of systematizations, strategies and resolutions through mathematical language (Navarro and Sousa, 2023).

4 Methodology

The research adopts a qualitative approach because it is an investigation into the identification of characteristics of Computational Thinking in problem-solving in 6th grade Mathematics textbooks of Middle School. It also examines how these aspects are presented in the process of producing meanings by students in the network, through the resolution of these problems.

The selection of these works considered the textbooks chosen by schools in the municipal education network of Juiz de Fora for the 2024-2027 triennium. The list of all schools in the network made available by the Municipal Secretariat of Education was used, supplemented by a search on the website of the *Fundo Nacional de Desenvolvimento da Educação* [National Fund for the Development of Education — FNDE], under the *Book Distribution* tab, where the Mathematics collections for Middle School were verified. Table 1 shows the number of titles identified in the research, allowing a quantitative analysis of the selected works.

Table 1: Number of schools that selected each wor

Title of textbook (collection)	Publisher	Authorship	Number of schools
A Conquista [The Conquest]	FTD	José Ruy Giovanni Júnior	10
SuperAÇÃO! [SuperACTION!]	Moderna	Lilian Aparecida Teixeira (responsible editor)	3
Matemática e Realidade [Mathematics and Reality]	Saraiva	Gelson Iezzi, Oswaldo Dolce and Antônio Machado	1
Araribá Conecta [Araribá Connects]	Moderna	Maria Regina Garcia Gay (responsible editor)	2
Projeto Apoema [Apoema Project]	Editora do Brasil	Linos Galdonne	2
Teláris Essencial [Essential Teláris]	Saraiva	Luiz Roberto Dante and Fernando Viana	8
Matemática Essencial [Essential Mathematics]	Scipione	Patrícia Moreno Pataro e Rodrigo Balestri	1

Source: Own elaboration

In these books, we chose to analyze the activities that involve measuring the area of rectangles. This object of knowledge was selected because the problems that make up the thematic unit *Magnitudes and Measurements* also allow for the exploration of numerical, algebraic and geometric concepts. When investigating the activities on measuring the area of rectangular regions in these works, we observed that they basically present three types of situations:

- a) determination of the area of a rectangular region, given its dimensions, displayed in a drawing or written in full;
- b) calculation of the measurement of one of the dimensions of a rectangle, providing the measurements of one of its sides and the area measurement;
- c) resolution of problems involving the determination of measurements, as in previous situations, with figures relating to sports courts, land, floor plans of houses and apartments, roofs, doors, windows and other rectangular regions present in school spaces.

5 Results

For the development of the research, three activities were developed, each corresponding to the aforementioned situations, preserving the characteristics and complexity of the questions proposed in the textbooks. The objective was to analyze how the aspects of Computational Thinking, in the context of Mathematics Education, manifest themselves in each of them, considering the assumptions presented by Navarro and Sousa (2023). These activities are presented in section 5.1 of the article.

Aiming to understand how the main characteristics of Computational Thinking can be observed in the resolution of problems solved by students, a didactic sequence with five activities was applied. In questions 1, 2 and 3, the students' recognition of elements and characteristics of the rectangle and the conceptualization of the magnitude of area were observed. Questions 4 and 5 were developed maintaining the style and complexity of the activities present in the previously mentioned textbooks, aiming at solving problems involving the measurement of the area of rectangles. The analyses of some questions answered by the students are presented in section 5.2.

5.1 Activities

Activity 1: Determine the area of the following geometric figure.

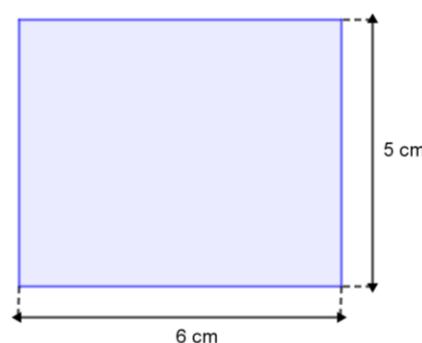


Figure 1: Area of the geometric figure (Own elaboration)

The proposed activity assesses the student's ability to determine the area of a rectangle, given its length and width. Regarding the mobilization of conceptual connections related to Computational Thinking, the following aspects were observed:

- *interpretation/analysis:* reading and interpretation of the problem, identifying that the

geometric figure corresponds to a rectangle;

- *abstraction/generalization*: visual recognition of the figure as a rectangle by observing the parallelism and congruence existing between the opposite sides of this quadrilateral, considering the absence of symbols to designate the internal right angles, or the use of a grid;
- *decomposition*: analysis and synthesis of information, with a view to recognizing that the area of a rectangular region is determined by the product of its dimensions;
- *systematization/strategy through mathematical language*: application of the characteristics of algorithmic and algebraic thinking, structuring the calculation to determine the unknown measurement, the area. Thus, it is concluded that the area of this rectangle is given by $A = 6 \text{ cm} \times 5 \text{ cm} = 30 \text{ cm}^2$. Furthermore, the appropriate unit of measurement is recognized, which in this case is the square centimeter.

Activity 2: Determine the length of a rectangle whose width is 8 m and area is 96^2 .

The activity aims to assess the student's ability to determine the measurement of an unknown dimension of the rectangle, using the measurement of one of its sides and the measurement of the reported area. Regarding the conceptual connections that aim at Computational Thinking, the following stand out:

- *interpretation/analysis*: reading and interpreting the problem, to identify the measurement to be calculated, in this case, the length of the rectangle;
- *decomposition*: organizing the information in order to observe that the resolution requires the manipulation of concepts related to determining the measurement of the area of rectangles;
- *systematization/strategy through mathematical language*: using the principles of algebraic thinking and algorithmic language to conclude that dividing the measurement of the area by the measurement of the width provides the measurement of the length of this rectangle, which is 12 m. In this process, mathematical meaning is given to the concept of length, which, as it is a linear measurement, must be expressed in meters. Another possibility would be to test values using the multiplication algorithm, identifying which measurement, when multiplied by 8 m, results in 96 m^2 .

Activity 3: The floor plan below shows some measurements of an apartment with all the rooms in a rectangular shape.

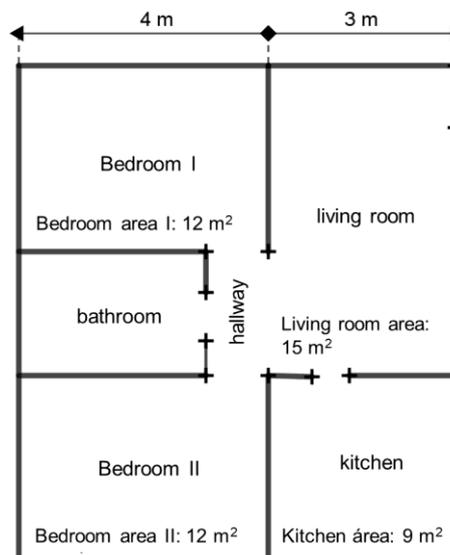


Figure 2: Floor plan of the apartment (Own creation)

Based on this information, determine: a) the length of the living room and the length of the kitchen; and b) the length of the entire area of the apartment.

In solving this problem situation, the following conceptual connections related to Computational Thinking were mobilized:

- *interpretation/analysis*: reading and interpreting the problem, initially recognizing that the measurement to be calculated refers to one of the dimensions of the room, which is the length (alternative a);
- *decomposition*: decomposition into subproblems, in order to sectorize the rooms in which the length measurement must be determined. Recognize the need to use concepts related to the area of rectangles, considering the rectangular shape of the living room and kitchen, and information about the width and area measurements of these rooms;
- *abstraction*: disregard of data and/or information that are not relevant in the resolution process, such as the area measurement of the bedrooms;
- *sistematização/estratégia por meio da linguagem matemática*: elaboração de uma estratégia de resolução, utilizando estruturas do pensamento algébrico e da linguagem algorítmica. Para a resolução da alternativa *a*, infere-se que para calcular a medida do comprimento deverá utilizar a operação inversa da multiplicação – a divisão. Assim, divide-se a medida da área pela medida da largura, concluindo que a medida de comprimento dessa sala é 5 m. Com procedimento análogo, conclui-se que a medida de comprimento da cozinha é 3 m. Para resolver o item *b*, reconhece-se que toda a área do apartamento corresponde a uma região retangular, cujo comprimento pode ser determinado pela adição das medidas de comprimento da sala e da cozinha ($5\text{ m} + 3\text{ m} = 8\text{ m}$), enquanto a largura é dada pela adição das medidas da largura do quarto I e da sala ($4\text{ m} + 3\text{ m} = 7\text{ m}$). Assim, a medida total da área do apartamento é $8\text{ m} \times 7\text{ m} = 56\text{ m}^2$.

5.2 Aspects of Computational Thinking in activities solved by students

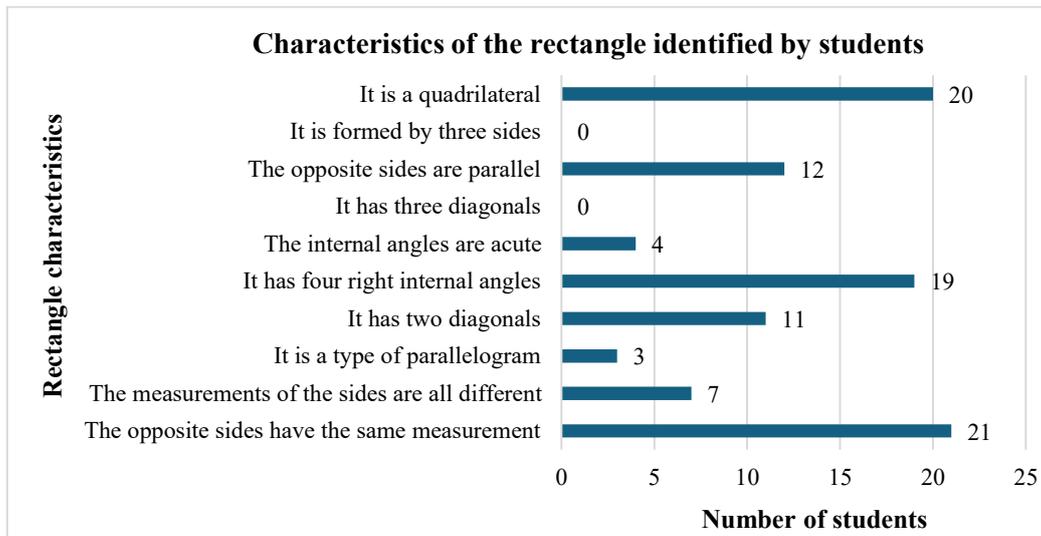
The teaching sequence was implemented at the Doutor Antonino Lessa Municipal School, part of the municipal education network of Juiz de Fora. The school offers afternoon classes for Middle School students, with two classes for seventh, eighth and ninth grades and three classes for sixth grade, with an average of 20 students per classroom. Thirty participants were selected to solve this activity: 10 sixth grade students, 10 seventh grade students, 5 eighth grade students and 5 9th grade students.

The first activity aimed to analyze how the students would express the elements and characteristics of the rectangle through a sketch. During the activity, all of them drew rectangles, showing attention to the parallelism and congruence between opposite sides, in addition to the presence of right angles. However, it was observed that they did not use the 90° angle symbol to designate them.

According to the BNCC (Brazil, 2018), this activity allows students to assess their ability to recognize, name, and compare polygons, considering sides, vertices, and angles. In addition, it allows them to draw these geometric figures using drawing materials or digital technologies (EF05MA17).

In the second activity, students were asked to identify the characteristics of the rectangle described in text, with sentences that allowed for multiple answers. The answers obtained were listed in Graph 1.

Graph 1: Characteristics of the rectangle identified by students



Source: Own elaboration

Through Graph 1, it was found that some of these students recognized the rectangle as a quadrilateral with parallel and congruent opposite sides, right internal angles and two diagonals. However, few students recognized the rectangle as a type of parallelogram and about 1/3 of the respondents did not identify any of these characteristics.

According to the BNCC (Brazil, 2018), this question assesses the student's ability to identify characteristics of quadrilaterals, classify them in relation to sides and angles and recognize the inclusion and intersection of classes between them (EF06MA20). In the BNCC Computing (Brazil, 2022b), the ability demonstrated in this activity consists of performing negation, conjunction and disjunction operations on logical sentences and *true* and *false* values (EF15CO03).

In the third question, we intended to observe the way in which students conceptualize the magnitude of area. Most students recognized *area* as a space or place, such as houses, apartments, schools or part of a plot of land. Others designated area as a measurement of surface area and some even associated it with the concept of perimeter or with the units of measurement of length (meter and centimeter). The responses obtained were summarized in Figure 3.

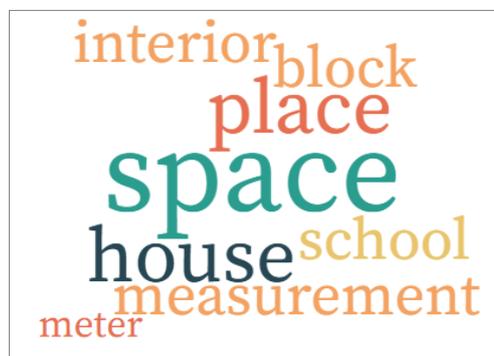


Figure 3: Word cloud (Own elaboration)

The fourth activity (Figures 4 and 5) required the determination and comparison of the area measurement of two rectangles arranged in a grid. Some resolutions were selected for analysis, considering the aspects inherent to Computational Thinking.

Regarding the aspects related to Computational Thinking, referring to activity 4 (Figure 4), the following are listed:

- *interpretation/exploration*: reading and interpreting the problem to identify the measurement of the area to be calculated;
- *decomposition*: analysis and synthesis of the information provided, attributing meaning to the concept of area as a measurement of surface area and to the elements that make up the activity, such as the grid, whose side of each square corresponds to 1 m;
- *generalization/abstraction*: recognition that the calculation procedure is analogous to the two rectangles;
- *systematization/production of mathematical knowledge*: inference that, since the area of each square that makes up the rectangle corresponds to 1 m², the measurement of the area of the rectangle can be determined by the sum of this number of squares. Thus, it is concluded that both have an area equal to 24 m².

Activity 4: Observe the rectangles drawn on the grid below.

a) Determine the area of the rectangle drawn on the grid below.

Resolução:

b) Based on the resolution of item A, what do you conclude, considering the measurements of the areas found?

Resolução:

Os Retângulos 1 e 2 são iguais.

Figure 4: Image of the resolution of activity 4 performed by one of the research subjects (Research data)

Regarding the aspects related to Computational Thinking, referring to activity 5 (Figure 5), the following are listed:

- *interpretation/exploration*: reading and interpreting the problem to identify the measurement of the area to be calculated;
- *decomposition*: analysis and synthesis of the information provided, attributing meaning to the concept of area as a measurement of surface area and to the grid, in which the side of each square corresponds to 1 m;
- *generalization/abstraction*: recognition that the calculation procedure is analogous to the two rectangles;
- *systematization/production of mathematical knowledge*: inference that, since the side of each square that makes up the rectangle corresponds to 1 m, the measurement of the length and width of rectangle 1 corresponds to 6 m and 4 m, respectively. Then, it is recognized that the measurement of the area of a rectangular region is given by the product of its dimensions and, thus, it is calculated: $6\text{ m} \times 4\text{ m} = 24\text{ m}^2$. When

performing the same procedure on rectangle 2, it can be concluded that both have the same area.

Activity 4: Observe the rectangles drawn on the grid below.

a) Determine the area of the rectangle drawn on the grid below.

Resolução:

Que uma área e a mesma que a outra

b) Based on the resolution of item A, what do you conclude, considering the measurements of the areas found?

Resolução:

Os dois tem o mesmo resultado

4	8
x 3	x 3
—	—
12	24
24	24

Figure 5: Image of the resolution of activity 4 performed by one of the research subjects (Research data)

Regarding the performance of this activity, the following skills were observed in the BNCC (Brasil, 2017):

(EF04MA21) Measure, compare and estimate the area of flat figures drawn on a grid, by counting the squares or halves of squares, recognizing that two figures with different shapes can have the same area measurement (p. 291).

(EF07MA31) Establish expressions for calculating the area of triangles and quadrilaterals (p. 307).

In the BNCC Computing (Brazil, 2022b), the skills observed were:

(EF69CO02) Develop algorithms that involve sequential, repetition and selection instructions using a programming language (p. 56).

(EF06CO04) Construct problem solutions using the decomposition technique and automate such solutions using a programming language (p. 38).

(EF06CO05) Identify the resources or inputs needed (inputs) to solve problems, as well as the expected results (outputs), determining the respective types of data, and establishing the problem definition as a relationship between input and output (p. 38).

The fifth activity (Figures 6 and 7) consisted of solving a problem that involves determining the area of a rectangular region, given its dimensions.

Activity 5: The floor plan below shows the measurements of the living room and kitchen in Ana's house, both rectangular in shape.

a) Determine the measurement of the entire area corresponding to the living room and kitchen in Ana's house.

Resolução:

5	6	30	Res. medida do sala e cozinha de Ana tem 32 m
x 4	x 4	+ 12	
30	12	32	

b) Ana intends to remodel the kitchen, and to do so she bought rectangular floor tiles with an area of 0.12 m². How many tiles, at least, will be needed to cover the kitchen?

Resolução:

12,6 m² Resposta no mínimo necessarios 100 peças

c) The floor tiles purchased by Ana were sold in boxes containing 20 units of floor tiles in each. If each box cost R\$60.00, how much did Ana spend on the purchase of these floors?

Resolução:

x 60	Resposta gastou R\$ 1.200,00 nos compra desses pisos
30	
1.200	

Figure 6: Image of the resolution of activity 5 carried out by one of the research subjects (Research data)

The conceptual links related to Computational Thinking observed in the resolution were:

- *interpretation/exploration*: reading and interpreting the statement, understanding that these rooms are rectangular in shape and identifying the measurements of the areas to be calculated;
- *decomposition*: analysis and synthesis of the information presented, attributing meaning to the concept of area as a measurement of surface area and recognizing that, in order to calculate the desired area, it is necessary to determine, separately, the measurement of the area of the living room and the kitchen;
- *systematization/strategy*: using aspects related to algorithmic and algebraic thinking, inference, in item a, that the measurement of the area of a rectangular region is given by the product of its dimensions and, thus, the area of the living room and the kitchen is determined, finding the measurements 20 m² and 12 m² respectively. Then, it is concluded that the entire area corresponds to 32 m². In item b, meaning is given to the concept of tiling and the measurement of the kitchen area is divided by the measurement of the area of each floor to conclude that 100 tiles will be needed to cover the kitchen. In solving item c, the unit price of the tile is confused with the price of the box containing 20 tiles, wrongly concluding that R\$1,200.00 will be spent.

Activity 5: The floor plan below shows the measurements of the living room and kitchen in Ana's house, both rectangular in shape.

a) Determine the measurement of the entire area corresponding to the living room and kitchen in Ana's house.

Resolução:

$$\begin{array}{r} 5 \\ \times 4 \\ \hline 20 \end{array}$$
 } A área do sala é 20 metros.

b) Ana intends to remodel the kitchen, and to do so she bought rectangular floor tiles with an area of 0.12 m². How many tiles, at least, will be needed to cover the kitchen?

Resolução:

$$\begin{array}{r} 12 \overline{) 12} \\ \underline{12} \\ 0 \\ \hline 1 \\ \hline 10 \end{array}$$
 } Que número $\times 0,1200$ vai dar 1,200? Que número $\times 100$ vai dar 120? } 10

c) The floor tiles purchased by Ana were sold in boxes containing 20 units of floor tiles in each. If each box cost R\$60.00, how much did Ana spend on the purchase of these floors?

Resolução:

Contando de vinte em vinte até 200 } Ela gastou 300 reais.

$$\begin{array}{r} 60 \\ \times 5 \\ \hline 300 \end{array}$$

Figure 7: Image of the resolution of activity 5 performed by one of the research subjects (Research data)

In this resolution, the same characteristics that correspond to Computational Thinking described in the analysis of the responses in Figure 4 were observed. However, some variations were identified in the resolution procedure, among which the correct answer to item *c* stands out.

In carrying out this activity, the following skills provided for in the BNCC (Brasil, 2017) were used:

(EF06MA28) Interpret, describe and draw simple floor plans of residences and aerial views. (p. 301).

(EF07MA32) Solve and develop problems to calculate the area of flat figures that can be broken down into squares, rectangles and/or triangles, using the equivalence between areas. (p. 307).

(EF08MA19) Solve and develop problems that involve area measurements of geometric figures, using area calculation expressions (quadrilaterals, triangles and circles), in situations such as determining land measurements (p. 313).

In the BNCC Computing, the following were identified:

(EF06CO04) Construct problem solutions using the decomposition technique

and automate such solutions using a programming language.

(EF06CO05) Identify the resources or inputs needed (inputs) to solve problems, as well as the expected results (outputs), determining the respective data types, and establishing the problem definition as a relationship between input and output.

(EF06CO06) Compare different particular cases (instances) of the same problem, identifying the similarities and differences between them, and create an algorithm to solve them all, using variables (parameters) to allow the treatment of all cases in a generic way (Brasil, 2022b, p. 38).

6 Final considerations

Considering that textbooks are among the materials most used by teachers in Basic Education, the objective was to observe how aspects of Computational Thinking are manifested in the resolution of problems present in these Mathematics textbooks, in the 6th grade of Middle School. For this analysis, it was based on a theoretical framework that conceptualizes Computational Thinking in the context of Mathematics Education, allowing the teacher to contemplate these analyses in their teaching process. In this sense, the studies by Navarro and Sousa (2023) served as a theoretical basis.

The characteristics aligned with Computational Thinking were identified both in the activities developed to analyze the questions *reflected* in textbooks and in the activities solved by the students. Thus, the viability of teaching methodologies that contemplate Computational Thinking in unplugged activities, through the resolution of problems present in textbooks, was evidenced.

When analyzing the activities completed by the students, the relevance of developing in students the conceptual aspects that operate as prerequisites for problem-solving was highlighted, in addition to the need to systematize the record — that is, formalize the ideas in a coherent manner and use the appropriate mathematical language to express them.

Conflict of Interest

The authors declare that there are no conflicts of interest that could influence the results of the research presented in the article.

Data Availability Statement

The data produced, or collected, and analyzed in the article will be made available upon request to the author.

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