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EDUCATIONAL GAME FOR LITERACY: WORD MARKET

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ABSTRACT

This work focuses on the theme of educational technologies in the context of early learning of writing. To this end, it delves into the concept of Computational Thinking and its direction to basic school education - Educational Computational Thinking. When approaching Computational Thinking, the strands called plugged (plugged - use of digital resources) and unplugged (unplugged - without use of digital resources) emerge. The research proposes its exploration based on the following considerations: What are the elements of Computational Thinking that enable a more contextualized teaching and learning? What is the concept of Literacy and Literacy? and What are the key elements of early learning to write? After a theoretical study about computational thinking, unplugged computational thinking, acquisition of the Alphabetic Writing System and national computing policies, the research starts with a theoretical-practical approach in the materialization of a learning object - a physical game based on the pillars of the PC aimed at literacy and literacy. In this article, the reader will find the printable of the game and guidelines for application in practice.

Keywords: Education. Computational Thinking. Literacy. Literacy.

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INTRODUCTION

It is not new that education reinvents itself and transforms itself to meet the needs of a society. In this case, education can be thought of as a social contract through which the collective achieves a common benefit. The establishment of a social contract goes beyond negotiation, in fact it reflects norms, commitments and principles of a formal nature and that are culturally incorporated (UNESCO, 2022). Education as a social contract comprises "a shared vision of the public purposes of education" (UNESCO, 2022, p. xii). This common benefit and public purposes end up being made tangible through educating, the development of skills and competencies, and insertion in public life. Thus, the subject goes through several learning and literacies in order to acquire the written language, understand the logic of a decimal numbering system, apply localization principles, etc.

On the one hand, there is a demand on the part of students to understand why they study each content proposed for their learning and connect it with their reality. Because of this, they increasingly request resources that are integrated into learning. The students of these generations, specifically Generation Z (born between 1995 and 2010) and Alpha/Alpha (born after 2010), are part of a group of people who know a world immersed in digital technologies. The labor, production, circulation and consumption relations they know are influenced by computer culture. These people are "peculiarly familiar with the new information and communication technologies" (ZEMKE; RAINES; FILIPCZAK, 2000 apud FERREIRA, 2019, p. 60-61), that is, they find it easier to appropriate a new technology for their own use.

On the other hand, teachers are in charge of the typical demands of the profession - such as dealing with the plurality of learners in the classroom - in addition to competing for space with the attractions of the *internet*, social networks, games, *streaming*, etc. Among the various challenges of education, a new reality is also established, in which the student becomes an author and producer of knowledge - a striking characteristic of Generation Z and Alpha/Alpha. This scenario implies the need to reinvent and transform oneself to meet these challenges, which imply "[...] to think, and plan the classroom as a place of "simulation" of social and cultural life, with the aim of making formal education a space in which the world is present in its amplitude and students perceive themselves as "present" in it" (BANNELL, et al., 2016, p. 120).

To circumvent these obstacles, educators resort to techniques, methodologies, instruments and technologies capable of meeting these current demands. However, very

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commonly, education professionals cling to digital technologies as a solution to classroom challenges, especially with this hyperconnected generation. However, the use of digital technologies imposes some challenges such as lack of resources, infrastructure, technical knowledge, etc.

Digital resources are not the only means of introjecting technology and dealing with the challenges of a more contextualized and connected education with reality. The concept of technology is not limited to the digital world alone. According to Bueno (1999), technology can be understood as:

> A continuous process through which humanity shapes, modifies and generates its quality of life. There is a constant need for human beings to create, their ability to interact with nature, producing instruments from the most primitive to the most modern, using scientific knowledge to apply the technique and modify, improve, improve the products arising from the process of interaction with nature and with other human beings (BUENO, 1999, p. 87).

In "Conversations about Education", by Rubem Alves, the author approaches the concept of technology in a somewhat poetic and reflective way. For Alves (2010), by birth the human being knows nothing and therefore needs to build "shells". The author makes a comparison between mollusks and humans. Mollusks are born knowing how to build the shells that help them protect themselves from predators and withstand the water pressure of the aquatic environment, the human being, on the contrary, knows nothing. Thus, it is up to Education to make the younger generations learn to build shells with the older generations (ALVES, 2010, p. 45).

After all, what are the shells that cover the human being? These shells are made up of everything that was invented and built for the survival of the species. "Knife is the improvement of teeth and nails. Stair is leg improvement. Glasses are eye enhancements. A computer is an improvement of the brain" (ALVES, 2010, p. 45).

Thus happened the invention of writing, like any and all technology, in order to compete with social, economic and cultural demands. The emergence of cities and the complexity of relationships began to demand some instrument/technique that allowed the recording of what could not and/or should not remain only in memory, such as commercial transactions, laws, historical facts, etc. The success of this technology made societies become graphocentric, that is, centered on writing. Thus, it was necessary to learn concomitantly to respond to the social demands for the use of writing (literacy) and the technology of writing itself (literacy) (SOARES, 2020).

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The acquisition of alphabetic writing, like any and all teaching and learning processes, contemplates the one who learns (apprentice), the object of study (alphabetic writing) and the one who teaches (educator). Without neglecting to take into account all the challenges raised above.

Education, especially Brazilian Education, has taken into account these challenges in order to meet the new demands of the national and world educational scenario. To this end, in recent years it has stipulated important milestones for the development of a more oriented education and consolidated in clear objectives to be achieved. As a result of these changes, more recently, the National Common Curriculum Base (BNCC) was enacted. The BNCC is a normative document that defines essential learning for students in all basic education (Early Childhood Education, Elementary School and High School). The Base brings the proposal to provide more educational equality and equity.

As part of its commitment to comprehensive education, the BNCC focuses on several issues relevant to the educational field, with special attention to the current context. This includes the ability to manage the flow of information in a digitized world and emerging digital cultures. Thus, the Base emphasizes the promotion of literacy and digital literacies, in addition to fostering digital inclusion.

In 2022, a complement to the BNCC of standards aimed at Computing in Basic Education is published, through CNE/CEB Opinion No. 2/2022. Later, Resolution CNE/CEB No. 1/2022 was issued in order to reinforce these standards, defining the contents and skills related to Digital Education. The document presents the contents and skills segmented by stage of basic education, as well as provides examples of practical activities of "Plugged Computing" and "Unplugged Computing". Plugged Computing refers to practices that make use of digital technologies, while Unplugged Computing refers to practices that use computing concepts without the use of digital technology.

In the following year, Law No. 14,533 was sanctioned, which institutes the National Digital Education Policy (PNED). The Law aims to promote public policies relevant to the population's access to resources, tools and practices in the digital world, with a focus on the most vulnerable population. In Article 3, item I, the Law reinforces the concept of Computational Thinking as one of the tools that ensures the insertion of digital education in school environments, as well as the stimulation of digital and informational literacy, and other digital skills.

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> I - computational thinking, which 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, with the application of computing fundamentals to leverage and improve learning and creative and critical thinking in the various areas of knowledge (BRASIL, 2023, nn).

In view of the above, this research aims to build a game based on Unplugged Computing, starting from the premises of Computational Thinking, which can contribute to a process of Literacy and Literacy more consistent with contemporary demands. To this end, the research will seek to:

- Identify the concept of Computational Thinking and Unplugged Computational Thinking in the literature;
- Establish a connection between the concept of Computational Thinking in Basic Education, more specifically in Early Childhood Education and Elementary School I, from a more democratic perspective through the premises of Unplugged Computational Thinking;
- Discuss the concepts of literacy and literacy;
- Point out the key elements in the field of initial learning of the written language;
- To produce a game based on the exploratory analysis of the concepts of Computational Thinking, to support the practice of teachers in the literacy and literacy stage.

THEORETICAL FRAMEWORK

NATIONAL CURRICULUM PARAMETERS (PCN'S) AND THE NATIONAL COMMON CURRICULAR BASE (BNCC)

In 1997, Brazilian Education established an important milestone towards clearer objectives in the educational system, the National Curriculum Parameters (PCN's). The PCN'S represent a quality reference for the stage of Elementary Education. It is their responsibility to guide and ensure cohesion in the investments made to education, raising discussions, studies and instructions, taking into account the participation of professionals in the field of education. Its entire organization is based on the General Objectives of Elementary Education, considering the cognitive, affective, physical, aesthetic, ethical and social insertion/performance aspects.

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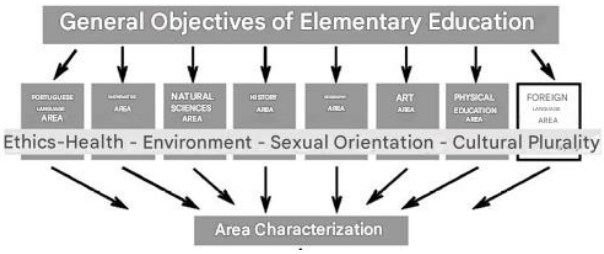
At the end of compulsory education, students must acquire these skills, an acquisition that must be delivered through the integration of all areas that make up Elementary Education, namely: Portuguese Language, Mathematics, Natural Sciences, History, Geography, Art, Physics and Foreign Language.

In the PCN's, each curricular component is presented as a specific area, as shown in Figure 1.

Figure 1 - Specific Areas of the National Curriculum Parameters.



Source: Brazil (1998, p. 71).

However, in 2010 the CNE/CEB Opinion No. 7/2010 is deliberated, which brings some significant changes, among them: "Art. 1 This Resolution establishes the National Curriculum Guidelines for Elementary Education of 9 (nine) years to be observed in the curricular organization of the education systems and their school units", that is, Elementary Education goes from 8 (eight) years to 9 (nine) years. Along with this change, there is an important change in the specific areas of the PCN's, which now constitutes the Language Area, in order to favor communication between the areas:

> Art. 13 The contents [...] are made up of curricular components that, in turn, are articulated with the areas of knowledge, namely: Languages, Mathematics, Natural Sciences and Human Sciences. The areas of knowledge favor communication between different systematized knowledge and between these and other knowledge, but allow the references of each curricular component to be preserved (BRASIL, 2010, p. 4).
>
> Art. 15 - The compulsory curricular components of Elementary Education shall be organized as follows in relation to the areas of knowledge:
> I - Languages:
> a) Portuguese language;
> b) Mother Tongue, for indigenous populations;
> c) Modern Foreign Language;
> d) Art; and
> e) Physical education; [...]
> (BRASIL, 2010, p. 4)

In 2017, the National Common Curricular Base (BNCC) was approved, which strengthens this composition of the Language Area. One of the objectives of the BNCC's

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Language Area is to reduce the large space that the written language has taken in schooling and to integrate the student's participation in diversified language practices. In addition to CNE/CEB Opinion No. 7/2010, the BNCC highlights two other considerable factors for the grouping of these components.

One of the factors concerns the articulation with Early Childhood Education in the search to promote different languages in an integrated way. These languages are worked through the structuring axes of Early Childhood Education: Interactions and Games (Figure 2). The second factor is related to the use of digital technologies, which transform communicative practices through content that involves texts, sounds, images, videos, etc.

Given that the BNCC is focused on a curriculum by competencies, a know-how, the Portuguese Language is organized based on: 1. Competencies; 2. Fields of Action; 3. Language Practices, 4. Objects of knowledge and 5. Skills.

Figure 2 - Organization of the Portuguese Language – BNCC.

PRÁTICAS DE LINGUAGEM	OBJETOS DE CONHECIMENTO	HABILIDADES
TODOS OS CAMPOS DE ATUAÇÃO		
Leitura/escuta (compartilhada e autônoma)	Reconstrução das condições de produção e recepção de textos	**(EF15LP01)** Identificar a função social de textos que circulam em campos da vida social dos quais participa cotidianamente (a casa, a rua, a comunidade, a escola) e nas mídias impressa, de massa e digital, reconhecendo para que foram produzidos, onde circulam, quem os produziu e a quem se destinam.
	Estratégia de leitura	**(EF15LP02)** Estabelecer expectativas em relação ao texto que vai ler (pressuposições antecipadoras dos sentidos, da forma e da função social do texto), apoiando-se em seus conhecimentos prévios sobre as condições de produção e recepção desse texto, o gênero, o suporte e o universo temático, bem como sobre saliências textuais, recursos gráficos, imagens, dados da própria obra (índice, prefácio etc.), confirmando antecipações e inferências realizadas antes e durante a leitura de textos, checando a adequação das hipóteses realizadas. **(EF15LP03)** Localizar informações explícitas em textos. **(EF15LP04)** Identificar o efeito de sentido produzido pelo uso de recursos expressivos gráfico-visuais em textos multissemióticos.

Source: Brazil (2018, p. 94 – 95).

In the context of the Portuguese Language, the BNCC, as already seen, dialogues with other guiding documents - such as the PCN's - that bring a socio-interactionist perspective of language. This language bias comprises the construction of linguistic and communicative skills through communicative situations (enunciative-discursive), that is, it considers that the text emerges from the communicative spheres. Thus, consider who will read the text, how it will circulate, its supports and intentionality. Texts end up being constructed through communicative situations through certain language practices.

In the organization of the Portuguese language, it is possible to verify a progression that starts from the practices considered as everyday (field of everyday life) towards more conventionalized practices (predominance of written and oral - field of action in public life). Thus, in Elementary School - Early Years, primary genres are worked on, those that are

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closer to literacy and that belong to the culture of childhood. Examples of primary genres are parlenda, tongue twisters, lists, letter, poster, etc.

Also, in the organization of the Portuguese language, the BNCC is based on some theoretical assumptions, as shown in Chart 1.

Chart 1 - Theoretical Assumptions of the Portuguese Language in the BNCC.

Text Centrality	Use texts of social circulation for the elaboration of activities
Enunciative-discursive perspective	Consider that every text has an intention, effect, audience, communication channel
Language practices	Written, oral, oral text, sounds, videos, etc.
Textual genres	Communication tools. Examples: letter, poster, cartoon, *email*, shopping list, menu, etc.
Fields of action	Grouping of textual genres

Source: Adapted from Brazil (2018).

The BNCC establishes and reinforces the teaching of the Portuguese language centered on the text. In the first two years of Elementary School, the focus of pedagogical practices should be concentrated on the teaching of the Alphabetic Writing System (SEA), taking into account:

> 1) The development of phonological awareness/knowledge of the alphabet; and 2) The understanding of written language as a fundamental tool for communication and socialization, which occurs through the most varied types of texts (BRASIL, 2018, p. 90 - 91).

Likewise, it is foreseen for children in Early Childhood Education the insertion into the Alphabetic Writing System (SEA) through alphabet recognition, development of phonological awareness and writing hypotheses. In such a way, that the transition between Early Childhood Education and Elementary Education - Early Years is a continuous passage. Preserving their social knowledge of writing, their repertoire and their oral productions from the retelling of stories, singing of legends and songs, already much explored in the stage before Elementary School.

LITERACY

Magda Becker Soares, educator, linguist and reference in literacy in Brazil, conceptualizes language as a tool for interaction between people. Thus, the language

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assumes a socio-interactive function - like that already seen in the PCN's and BNCC. This function is materialized through the social use of texts, through interactions, when we speak and write, or when we listen to and read a text.

Writing emerges from cultural and social demands, both commercial and cultural. The child acquires reading and writing skills through activities related to literacy. Literacy is a cognitive and linguistic process distinct from literacy, although it occurs simultaneously with it. It involves the ability to use the technology of writing (literacy) and integrate it into social practices. These practices include informing oneself and interacting with others, immersing oneself in the playful/imaginary, expanding knowledge, supporting memory, and participating in reading and text production activities (SOARES, 2020).

The systematic learning of alphabetic writing, SEA, key to the culture of writing, involves three essential parts: the learner - who is the child in the learning process; the object of study - which is alphabetic writing and its applications; and the educator - the one who teaches (SOARES, 2020).

The child's entry into the culture of writing occurs through the object of the literacy process, that is, the Alphabetic Writing System (SEA). This system represents the *signifier* of words and not their *meaning* (SOARES, 2020). By appropriating the SEA, the child acquires two important learnings: 1. "learns that the oral word is an independent sound chain and its meaning can be segmented into small units" (SOARES, 2020, p. 43) and 2. "learns that each of these small sound units of the word is represented by specific visual forms - the letters" (SOARES, 2020, p. 43).

The system that represents the *signifier* refers to the chain of sounds that symbolizes a being, concept and/or an idea. The system that represents meaning is the being itself, the concept and the idea to which the chain of sounds refers. When writing was invented, the only resource available was the drawing minted in clay or clay to visually represent communication, that is, the *meaning* of words (Figure 3). A system of representation of the *signifier* is based on the sounds of words. This system is marked by the emergence of the alphabet (Figure 4), considered one of the most significant inventions in the history of humanity, giving a characteristic of efficiency in the acquisition of written language and communication (SOARES, 2020).

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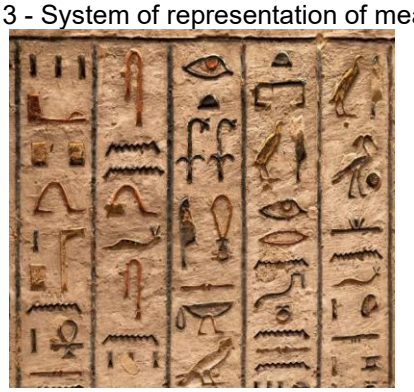
Figure 3 - System of representation of meaning.



Source: Brasil Escola (https://brasilescola.uol.com.br/).

Figure 4 - Latin alphabet (hieroglyphics).

Source: Pixabay (https://pixabay.com/pt/).

In graphocentric societies, where reading and writing play central roles, the child, even before entering the school system, gradually begins to become familiar with the concept of writing. In such sociocultural environments, the child observes that writing serves to transform speech into visible marks on various supports, such as paper and digital screens. In addition, he learns that reading consists of converting these marks back into speech. For example, a child who sees their parents reading a book or texting begins to understand that these activities involve decoding visual marks to understand and reproduce speech. Likewise, when playing with pencil and paper, the child experiences writing as a means of recording and sharing their ideas verbally (SOARES, 2020).

From a young age, children engage in drawing activities with the assumption that they are, in fact, "writing." They understand writing as a form of representation of ideas and meanings, similar to the first writing systems. However, as they enter and experience the use of writing in their family, cultural and school contexts, they begin to realize that writing is not to be confused with drawing. Writing is composed of strokes, strokes, and specific lines, and thus they begin to "write" imitating these more conventional forms (SOARES, 2020, p. 61).

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To this end, it is necessary that the child be exposed to situations that guide the understanding that writing is done through letters. Thus, this can be done through:

- Alphabet on the wall;
- Mobile alphabet;
- Cards with one's own name - work on letters, reading, comprehension of writing from left to right;
- Chart with the daily routine;
- Activities involving legends, songs and poems - develop phonological awareness;
- Manipulation of different writing vehicles: magazines, comic books, brochures, books, etc.

Vygotski (1896 - 1934) emphasizes the importance of learning provided by the social, cultural and school context for the child's development to advance. Thus, it is important to have a pedagogical mediation that stimulates the child's learning in his development process (VYGOTSKI, 1991). From this analogy and all the above about educational challenges (how to diversify practices) and language acquisition, especially writing, the importance of pedagogical differentiation comes to light.

COMPUTATIONAL THINKING (UNPLUGGED)

The concept of Computational Thinking emerged around 1967 with the development of the programming language "Logo", idealized by Cynthia Solomon, Wally Feurzeig and Seymour Papert. Among these, Seymour Papert is particularly notable for his significant contributions to the deepening of research on Computational Thinking (PAPERT and SOLOMON, 1971).

"Logo" is an interpreted programming language, which consists of a type of code translated and executed by an interpreter in different layers of the system. Designed to be accessible to both children and adults, the language allows the user to give commands to a "Turtle", which is a graphic robot, to perform various tasks. These commands are often related to the creation of graphic records, such as drawing and painting on the canvas. In this way, the graphic robot performs the function of a pen within the program's environment (PAPERT, 1980).

Seymour Papert (1928-2016), co-creator of the "Logo" programming language, emphasizes the constructionist philosophy underlying this approach. In constructionism, the

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learning process is centered on the active construction of knowledge by the learner through the use of the computer. The computer, in this context, works as a support tool that facilitates and enriches the educational process, allowing the user to enhance their learning through exploration, interaction and investigation (PAPERT, 1980).

In addition, Papert, in collaboration with Cynthia Solomon, presented concepts that would later be recognized as Computational Thinking in the work "Twenty Things to Do with a Computer". Subsequently, in his publication "Mindstorms: Children, Computers, and Powerful Ideas", Papert explores the impact of computers and technology on the educational process of children. In his work, Papert argues that the computer has the potential to enrich not only Mathematics Education, which was his main focus, but also other areas of knowledge (PAPERT, 1980).

The concept of Computational Thinking re-emerges and gains prominence in 2006, with the work of Jeannette Wing. This year, the computer scientist published an article entitled "Computational Thinking", in which she characterizes computational thinking as a widely applicable approach and a set of essential skills for everyone, not just computer scientists (WING, 2006, p. 33).

According to the author, computational thinking "is based on both the capabilities and limitations of computational processes, carried out by humans or machines" (WING, 2006, p. 33). In addition, she states that computational methods and models facilitate and sustain the resolution of problems, the creation of systems that would be unfeasible without this approach, and the understanding of human behavior, through the application of concepts from computer science (WING, 2006, p. 33).

The CIEB - Innovation Center for Brazilian Education addresses computational thinking based on these principles and on the definitions proposed by Wing, using these references to guide the elaboration of the technology and computing curriculum in basic education. According to CIEB, Computational Thinking:

> It refers to the ability to solve problems based on computer knowledge and practices, encompassing systematizing, representing, analyzing and solving problems. Computational Thinking has been considered as one of the fundamental pillars of the human intellect, along with reading, writing and arithmetic, since it is also applied to describe, explain and model the universe and its complex processes (CIEB, n.d., n.p.).

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In the specific context of basic education, known as K-12 in its country of origin, Wing (2006) argues that computational thinking should be integrated into children's analytical skills, especially in the areas of reading, writing, and arithmetic.

With the advances in its studies, Computational Thinking is now understood in four basic pillars for its understanding, as shown in Chart 2.

Chart 2 - Pillars of Computational Thinking.

Abstraction	Decomposition
Data filtering and sorting refers to the process of distinguishing between the elements of greater relevance and those of lesser importance. This procedure includes organizing the information into structures that facilitate problem solving.	The identification of a problem, which may be complex in nature, and its subsequent division into smaller parts aims to facilitate analysis, understanding and resolution. This process also includes determining the components that can be disaggregated and reconfigured to formulate an effective solution to the problem.
Pattern Recognition	**Algorithm**
Detailed and individualized analysis of these problems involves identifying and mapping similar problems that have already been solved previously. This process seeks to recognize common patterns between problems. During the decomposition of a complex problem, it is essential to identify recurring patterns in subproblems, which can lead to an effective and efficient solution to the original problem.	Movements, steps or rules formulated to address the resolution of each identified sub-problem can be employed in the elaboration of a code and/or program. These elements can be interpreted by both computer systems and humans, and used to solve problems through various methods, such as diagrams, pseudocode, and programming languages.

Source: Adapted from LIUKAS (2015), GROVER AND PEA (2013) and CODE.ORG (2015).

Despite the efforts of several authors and investigations to define Computational Thinking, there is still no consensus on its meaning. The concept is constantly evolving, as evidenced by Wing's works. As it is a concept of a historical-social nature, it is limited and also adapts to the context in which it is inserted. In addition, the discussion on Computational Thinking is not restricted exclusively to Computer Science, but also encompasses practices related to the design of systems, analysis of human behavior and the development of critical thinking (WING, 2010).

Although plugged computational thinking is the most widely promoted, unplugged computational thinking has gained considerable attention recently. This approach emerges as an effective alternative to address the concepts of Computational Thinking in a more comprehensive and accessible way.

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UNPLUGGED

Unplugged Computational Thinking builds on long-established practices to teach computer science concepts without the use of digital resources, as exemplified by the "Computer Science Unplugged" program. This approach, which integrates the principles of Computer Science, guides students in problem solving by emphasizing three main aspects: the identification of the essential elements for solving the problem (abstraction), dividing the problem into smaller and more manageable parts (decomposition), and formulating a systematic process to solve the problem (algorithmic thinking).

The term "Computer Science Unplugged" emerged with the publication of a series of activities in the early 1990s, which was later consolidated in the free online book entitled "Computer Science Unplugged: Offline Activities and Games for All Ages", written by Tim Bell, Mike Fellows and Ian Witten (BELL; WITTEN; FELLOWS, 1999).

By offering computer-free activities based on hands-on learning and playful and resilient approaches, it is possible to promote a number of potential benefits, as described in Chart 3.

Chart 3 - Unplugged computing.

Author	Benefits
Bell, T., Curzon, P., Cutts, Q., Dagiene, V., Haberman, B.	Challenging stereotypes and overcoming the barriers associated with learning programming, often perceived as essential only for understanding computer science concepts and restricted to the technological area, is crucial. This involves re-evaluating the idea that programming is a competence unique to technology and recognizing its applicability and importance in diverse knowledge contexts.
Hromkovič, J., Lacher, Prieto-R Rodriguez, E., Berretta, R.	Promoting a deeper engagement of students with the fundamental concepts of computer science, demystifying the notion that this discipline is limited exclusively to programming, is essential. In addition, it is important to support the construction of a spiral curriculum, in which students develop a comprehensive and progressive view of their learning process.
Koblitz, N.: Crypto galore! In fashion: Bodlaender, H.L., Downey, R., Fomin, F.V., Marx, D. (eds.)	Stimulating the development of strategies for contexts in which digital resources are not available—whether due to the complete absence of computers, internet, etc., or various factors such as technical problems and restricted access due to low availability—is crucial.

Source: Adapted from Hromkovic and Lacher (2017).

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METHODOLOGY

The present research adopts a theoretical-practical methodology, structured in two main stages: the theoretical analysis and the elaboration of a learning object based on the surveys about the key elements for initial learning of the written language and pillars of Computational Thinking (Unplugged).

The first stage of the research consists of a review of the literature and relevant pedagogical documents. This phase aims to support the theoretical and methodological framework that will guide the construction of the learning object. Normative and guiding documents are examined, such as the National Common Curricular Base (BNCC) and the National Curriculum Parameters (PCN's). The analysis of these documents allows us to identify the guidelines and curricular requirements regarding the teaching of essential skills and the development of computational thinking in basic education.

In addition to the official documents, the research includes a detailed review of the academic literature on computational thinking and its application in literacy. The theoretical framework addresses fundamental concepts, recommended pedagogical practices and previous studies that explore the integration of computational thinking in initial education. Relevant authors and theories on knowledge construction and teaching methodologies are also consulted to provide a solid foundation for the development of the learning object.

The second stage involves the practical application of theoretical concepts in the creation of a specific learning object, which consists of an educational game aimed at literacy based on computational thinking. The game is designed to support children's literacy by incorporating principles of computational thinking, such as decomposing problems, identifying patterns, and devising algorithms.

The proposed methodology aims at a systematic and integrated approach, combining theoretical foundation with pedagogical practice to promote a more contextualized literacy and literacy process through computational thinking.

RESULTS AND DISCUSSION

The educational product developed is an educational game adapted from the Haathi Mera Saathi / My Elephant Friend board gamification. The board game is made up of grids, cards with drawings of bananas and trees, and a character – the elephant. In it, the player needs to sequence a series of moves to capture the bananas and dodge the trees. As if he were programming the elephant. To do this, you have the tokens with "Go Forward", "Turn

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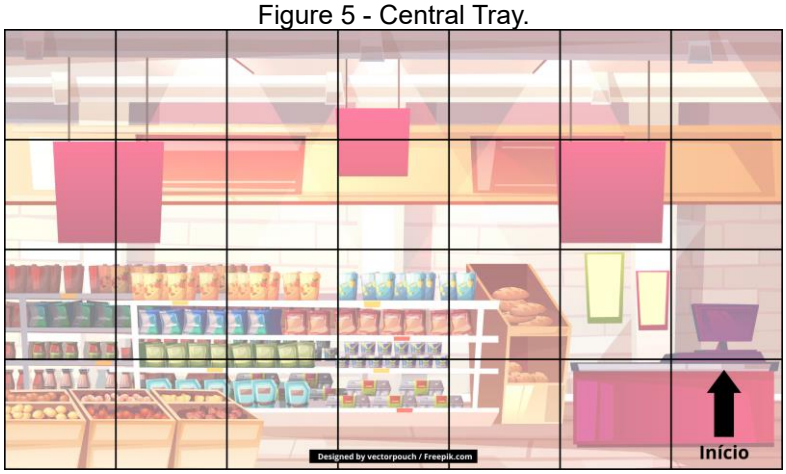
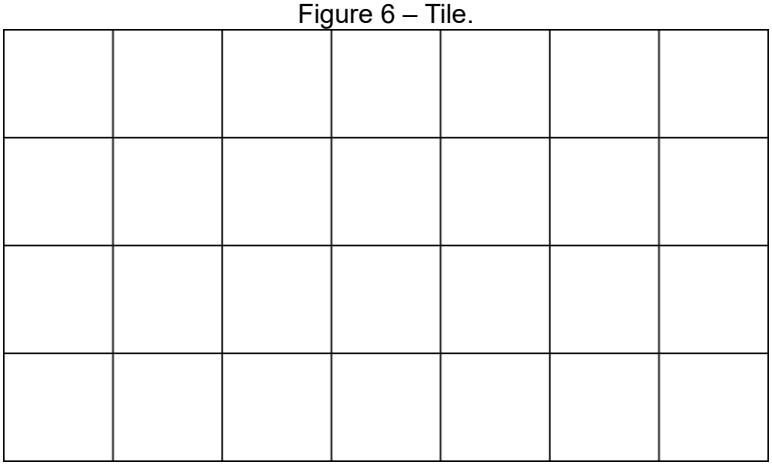
Left", "Turn Right" and "Eat" movements available. In the "Word Market"[1] the player has the challenge of sequencing a series of movements to capture the letters arranged on the board and form the word of the chosen food. The game is formed by the central board (Figure 5), Tile (Figure 6), Alphabetic Pieces (Figure 7), Food Pieces (Figure 8) and Movement Pieces (Figure 9).

Figure 5 - Central Tray.



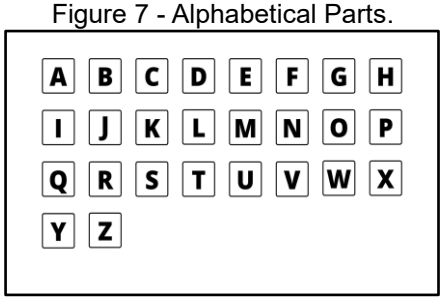
Source: From the authors. Background image: Designed by vectorpouch / Freepik.com.

Figure 6 – Tile.



Source: From the authors.

Figure 7 - Alphabetical Parts.



Source: From the authors.

[1] Game Printable Link: https://drive.google.com/file/d/1qcPmr0yHGEww-bk2nP5aW_ljTB7HtFHl/view

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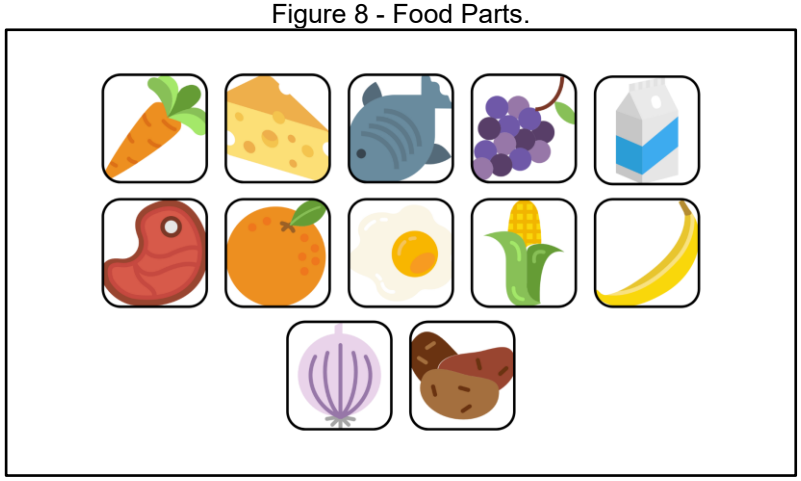
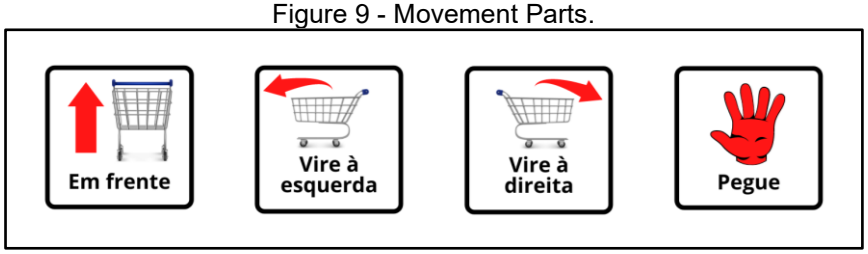
Figure 8 - Food Parts.



Source: From the authors. Images: Flaticon.com.

Figure 9 - Movement Parts.



Source: From the authors. Images: Designed by upklyak / Freepik.com.

Preparation guidelines:

1. Printable of the structure (boards, letters and pieces) in physical version;
2. Contact paper and/or plastic for laminating (if machine lamination is chosen);
3. Cardboard in the format of the size chosen for printing the structure;
4. Scissors (cutting out the pieces of the game);
5. Print the structure (boards, letters and pieces);
6. Cut out the parts as marked on the printable;
7. Create a base of the parts (boards, letters and pieces) with cardboard and/or any similar material. This step will ensure greater durability (optional);
8. Wrap the parts (boards, letters and pieces) with contact paper and/or lamination. This step will ensure greater durability (optional).

The educational product in question, Educational Game for Literacy - Word Market, is aimed at the segments of Early Childhood Education (Preschool | 4 and 5 years old) and Elementary Education - Early Years (1st - 2nd year) of Basic Education. In Early Childhood Education, the game must go through the structuring axes (interactions and games) of the pedagogical practices provided for in this stage of Basic Education, according to article 9 of the DCNEI - National Curriculum Guidelines for Early Childhood Education translated into

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the Rights of learning and development (Living together, Playing, Participating, Exploring, Expressing and Knowing Yourself). Also, the game must go through the Fields of Experiences (1. The I, the Other and the We, 2. Body, gestures and movements, 3. Traces, sounds, colors and shapes, 4. Listening, speaking, thinking and imagination, and 5. Spaces, times, quantities, relationships and transformations) and Learning and development objectives (defined by age group). At this stage, the game comes in as a tool to enhance the different literate practices that surround the student, since it is only expected that this child is literate in the 1st and 2nd grades of Elementary School (Brasil, 2018).

In Elementary School - Early Years (1st - 2nd year) the game can be associated within the various practices themed in the curricular components (Arts, History, Geography, Science and Mathematics), with a focus on the Portuguese Language component. Also, taking into account the fact that literacy is the focus of pedagogical practices in the first two years of Elementary School (Brasil, 2018). For the child to acquire the construction of written spoken language, he needs:

- Differentiate drawings/graphics (symbols) from graphemes/letters (signs);
- Develop the ability to recognize words globally (which we call "incidental" reading, as is the case with reading logos on labels), which will then be responsible for reading fluency;
- Build knowledge of the alphabet of the language in question;
- Understand which sounds should be represented in writing and how;
- Build the phoneme-grapheme relationship: the perception that letters are representing certain speech sounds in precise contexts;
- To perceive the syllable in its variety as the phonological context of this representation;
- Until, finally, understanding the relationship between phonemes and graphemes, in a specific language (Brasil, 2018, p. 90 - 91).

DEVELOPMENT OF THE ACTIVITY

Organization

1. Make the central board (Figure 5) available at the game site;
2. Set up a pile with the food pieces (Figure 8), a pile with the alphabetic pieces (Figure 7) and a pile with movement pieces (Figure 9) next to the central board (Figure 5);

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3. Give the student the Tile (Figure 6) that will be used for the arrangement of the movement pieces (Figure 9);
4. Leave the stacks of alphabetic tiles (Figure 7) and movement (Figure 9) facing up and available to the student. In these piles, the student can explore as many times as he wants;
5. Leave the pile of food parts (Figure 8) face down. In this pile, with the pieces shuffled randomly and/or organized according to the teacher's preference, one piece will be removed at a time.

Routing

1. The student removes a piece from the pile of food (Figure 8) and places it somewhere on the central board (Figure 5);
2. With the knowledge of the chosen food, the student removes the letters from the pile of alphabetic pieces (Figure 7) to form the word. Then, he positions each letter at a different point on the central board (Figure 5);
3. With his Tile (Figure 6) in hand, the student removes the pieces from the pile of movement pieces (Figure 5) and needs to assemble his sequence in order to capture all the letters in the correct order and finally capture the piece of food (Figure 8) – which contains nutritional information of that food. At the end, the piece is read.

Ex: The student removes the card containing the image of a fish in the pile of food (Figure 8) and places it on the central board (Figure 5). From this action, the student collects the letters "P", "E", "I", "X", "E" in the pile of alphabetic pieces (Figure 7) and arranges them at different points on the central board (Figure 5). With the tile (Figure 6), remove the tiles from the stack of motion tiles (Figure 9) and assemble the sequence from the steps (forward, turn right, turn left, etc.) to collect the letters "P", "E", "I", "X", "E" in order and form the words "fish" at the end. Then, the student continues to make the movements (forward, turn right, turn left, etc.) until he collects the food card.[2]

[2] Link to the Activity Simulation Video. SOUSA, Jonas Moraes. Word Market Simulation. YouTube, October 23, 2024. Available at: <https://youtu.be/n_fw05hpDkk>.

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How does the game proposal develop computational thinking?

As has been presented throughout this research, Computational Thinking refers to the ability to approach and solve problems using knowledge and practices from computer science. This process involves the systematization, representation, analysis and resolution of questions, in a structured way. Currently, it is considered one of the essential pillars of the human intellect, along with reading, writing, and arithmetic, as it also contributes to describing, explaining, and modeling phenomena of the universe and its complex processes (CIEB, n.d.).

To this end, Computational Thinking is structured in an arrangement of four pillars that encompass this systematization, representation, analysis and problem solving in a coordinated way. To achieve the proposal of a game based on the premises of Computational Thinking, the educational product covers the four pillars in its applicability.

The ability to create an algorithm through the sequencing of movements, a kind of "programming", can be considered as an abstract version of programming done with conventional languages (in block, writing, etc.). The student needs to use a set of instructions, sequence of movements, and manifest their "programming" through the construction of these series of movements, which generate instructions for the cart (Abstraction).

The student is putting into practice the skill of decomposition all the time, since it is necessary throughout the activity to divide the movements of the cart by means of the command cards. The instructions are basic and specific, that is, they only perform one type of action and only once. The student needs to add one command at a time to his series of movements and test it, then perform the same process again, instead of trying to elaborate the sequence at once (Decomposition).

The positions of the objects arranged on the board can be different (and often this is what ends up happening) with each turn. However, the logic remains the same. So is the logic of the movement parts. In this way, the student is faced with several patterns that can be used again in other sequences (Pattern Recognition).

The activity consists of creating algorithms for moving the cart and capturing the letters to formulate the selected word. A kind of "programming". With this, the student uses algorithmic thinking to sequence a series of movements to complete the proposed problem. Also, the student experiences different ways to achieve the same result, from sequences with their respective specific instructions (Algorithmic Thinking).

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How does the game's proposal dialogue with the practices of written language acquisition?

From the first years of life, even before starting formal schooling, children begin to build their understanding of writing through experiences with written language that they experience in their sociocultural and family contexts. However, it is only through the interaction between her cognitive and linguistic development and the systematic and explicit instruction offered in the school environment that she gradually assimilates alphabetic writing. This process involves recognizing writing as a system that represents the sounds of the language, known as phonemes, through letters. With this, the child begins to master the alphabetic principle and understand how writing works as a means of encoding and decoding speech (Soares, 2020, p. 51).

Initially, children understand writing as a vehicle to express themselves through the meaning of words, a principle used in the first writing systems - such as hieroglyphics. However, as they get involved and experience the practice of writing in the most varied contexts and living spaces, such as family and school, they begin to discern that writing is not equivalent to drawing. In this way, they come to understand that writing is formed by strokes, lines and lines with specific characteristics. Thus, they start to "write" by imitating conventional forms in a more structured way (SOARES, 2020, p. 61).

To ensure the acquisition of these concepts, the child needs to be introduced to activities that dialogue with the alphabetic principle, that is, that writing is done by words and that they represent sounds. This, in turn, can be done through the use of alphabet, movable alphabet, cards with one's own name, identification tags, parlendas (phonological awareness), songs (phonological awareness), etc.

Thus, the game has as a principle the exploration of the activities that already make the acquisition of the SEA, the culture of childhood and the field of daily life. Fields that dialogue with the insertion of different literate practices in Early Childhood Education and literacy in the first two years of Elementary School (BRASIL, 2018).

LETTER RECOGNITION

Mobile Alphabet: The mobile alphabet (Figure 10) is a pedagogical tool used in the teaching of reading and writing, especially in early childhood education and in the first years of elementary school. Its main purpose is to facilitate the learning of the relationship between phonemes and graphemes, helping students to understand and internalize the

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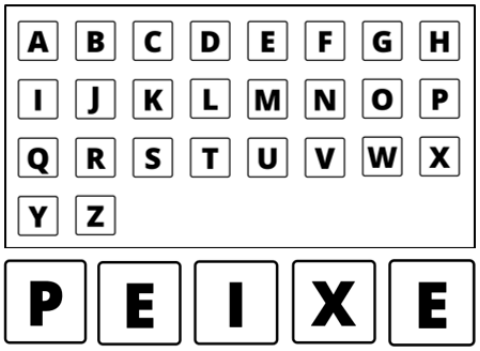
alphabetic principle. It allows children to manipulate physical letters and associate them with corresponding sounds, helping them become familiar with alphabetic symbols and their phonological values. It also helps in the formation and decomposition of words, allowing students to experiment with the combination of letters to create words and, consequently, understand their structure. Thus, through the alphabetic pieces of the game, children come into contact with the letters, are stimulated in their recognition and begin to explore the possibilities of creating words.

Figure 10 - Mobile alphabet – assembly.



Source: From the authors.

Letter pairing: Letter pairing involves matching letters and the sounds they represent. Letter pairing refers to the activity of associating letters (graphemes) with their respective sounds (phonemes). For example, the letter "b" is paired with the /b/ sound, and the letter "a" with the /a/ sound. This practice helps students understand how each letter contributes to word formation. The technique also involves the visual identification of letters and the reproduction or recognition of the corresponding sounds. This, in turn, can be worked on from the alphabetical sequence of the letters (asking the children to organize them in order), from the naming of the letters and/or reciting the alphabet.

Pairing of letters/words with images: This type of pairing consists of identifying the initial letter and words, with the respondent image. The child should relate each piece of food to the correct letter from the alphabetic pieces (Figure 11). This technique aids in the practice of reading and writing, as students need to recognize and identify the correct word in order to pair it with the appropriate image. Promoting word recognition and vocabulary building skills. Through Food Pieces and Alphabetical Pieces, the teacher is able to explore various pairing possibilities.

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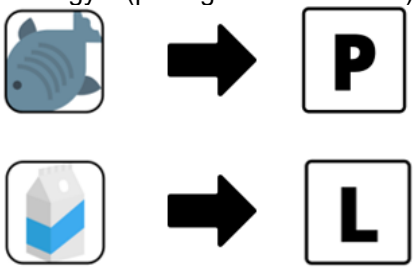
Figure 11 - Strategy 1 (pairing with initial letter) – montage.



Source: From the authors.

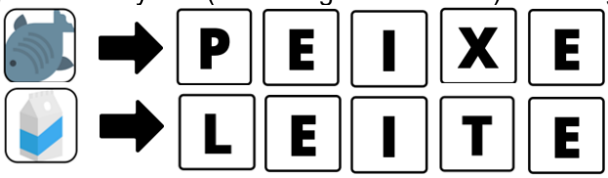
PHONOLOGICAL AWARENESS

Rhyme: Rhyme is a sound resource that involves the repetition of similar sounds, especially at the end of words (Figures 12 and 13). It is a technique widely used in poems, songs, and children's stories, which enriches language learning and contributes to the development of children's language skills. Through the Food Pieces and Alphabetic Pieces, the teacher has the possibility to explore rhyme only from the images, only through the words or using the images and words simultaneously.

Foods that rhyme with each other:

1. Fish – Milk

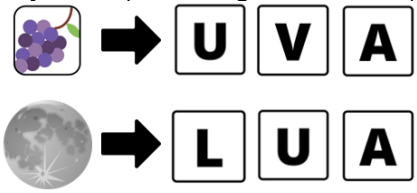
Figure 12 - Rhymes (from images and words) – montage.



Source: From the authors.

2. Grape – Moon

Figure 13 - Rhymes 2 (from images and words) – montage.



Source: From the authors. Moon-image: Pixabay.

Alliteration: Alliteration is a figure of speech that consists of the repetition of consonant sounds at the beginning of words that are close together in a sentence or verse (Figure 14). This resource creates rhythm, musicality and emphasis, and is widely used in

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poetry, music and literature. From the Word Market game it is possible to explore the organization from the initial letters and or the beginning of the words.

Figure 14 - Alliteration (organization by initial phonemes) – montage.

Source: From the authors. Bullet Image: J.A Doces.

Also, the game brings the possibility of activities from:

- Create a list with the name of the foods;
- Identify the length of the words / "Which food has the biggest/shortest name?";
- Words that start in the same way (e.g., coffee, meat, and shrimp);
- Words that end the same (beans, pasta and bread);
- Words that differ only by one letter - phoneme (duck-rooster / rooster-cat)

CONCLUSIONS

Education, as a social contract, evolves to meet the needs of a society in constant transformation. UNESCO's concern highlights the relevance of an educational approach that recognizes and integrates the demands of new generations, especially Generation Z and Alpha/Alpha, who are deeply influenced by digital culture and technology. For this, it is essential that educators not only adapt to digital tools, but also reconsider their pedagogical practices, promoting an environment where students can see themselves as protagonists in the construction of knowledge.

In view of this scenario, Brazilian Education has been showing concern in the area and materializing significant milestones that dialogue with these proposals. These initiatives aim to promote equality and inclusion, seeking to ensure that all students have access to quality education. Among these milestones, the National Curriculum Parameters (PCN's) and the National Common Curriculum Base (BNCC) shed light on this scenario. Also, looking at digital skills is essential to face the challenges of this generation. To this end, the institutions also materialize their efforts from the complement to the BNCC focused on computing (plugged and unplugged) and institutes Law No. 14,533 that institutes the National Policy for Digital Education. From the sanctioned law arises the movement focused on Educational Computational Thinking.

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Along with these significant milestones, the National Curriculum Guidelines are established through CNE/CEB Opinion No. 7/2010, bringing a significant change by expanding Elementary Education from 8 to 9 years old and reorganizing the curricular areas, creating the Language Area. This milestone is reinforced with the approval of the National Common Curriculum Base (BNCC) in 2017, whose objective is to expand students' language practices, overcoming the exclusive emphasis on written language and promoting a more diversified approach.

The BNCC highlights the articulation with Early Childhood Education, promoting the integration of different languages through the structuring axes of this stage: Interactions and Play. In the context of the Portuguese language, the BNCC adopts a socio-interactionist perspective, prioritizing the construction of language skills in real communication situations. In Elementary School, it emphasizes working with texts, starting from everyday practices to more formalized practices, such as textual and oral production in the public field.

In the Early Years, the BNCC suggests focusing on primary textual genres, close to literacy, such as legends and lists. In the first two years of Elementary School, teaching should focus on the Alphabetic Writing System (SEA), with emphasis on the development of phonological awareness and the recognition of the importance of written language as a tool for communication and socialization. The transition between Early Childhood Education and Elementary Education must be continuous, respecting the social knowledge and repertoire of the students, as well as their oral productions, such as storytelling and songs, already worked on in the previous stage.

Writing arises in response to cultural and social needs, and literacy is the process that enables the child to master the Alphabetic Writing System (SEA). Parallel to literacy, literacy occurs, a broader process that involves the integration of writing into social practices, such as being informed, interacting, immersing oneself in playfulness and expanding knowledge.

The appropriation of SEA by the child involves two fundamental learnings: the understanding that the spoken word can be segmented into smaller units (sounds) and that these units are represented by specific visual forms, the letters. This alphabetic system, one of the greatest inventions in the history of humanity, makes it possible to convert sounds into graphic symbols and vice versa, facilitating written communication. Initially, writing was represented by clay drawings, but the development of the alphabet significantly improved the efficiency of the writing process.

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For the process of acquiring the SEA, it is essential that the child is exposed to environments rich in stimuli related to writing, which may include activities with the use of the alphabet on murals, name cards, legends, songs, in addition to the handling of various writing vehicles, such as magazines and books.

The Computational Thinking strand now contributes to the proposals related to the acquisition of SEA, based on four fundamental pillars: abstraction, decomposition, pattern recognition and algorithmic thinking. These skills are considered pillars, transcending the area of computer science and manifesting themselves as skills for solving everyday problems. The term "Unplugged Computational Thinking" refers to pedagogical strategies that teach computer science concepts without the use of digital technologies.

This research has a reflective character and discusses the process of acquisition of written language, Computational Thinking, Educational Computational Thinking, Unplugged Thinking and teaching practices in the context of these themes. To this end, it develops a learning object, the "Word Market Game", with the objective of disseminating the potential of Computational Thinking, especially in its unplugged modality, in line with the knowledge provided in basic education and in the teaching and learning processes. The research intends, therefore, to contribute to the reflection on the incorporation of Unplugged Computational Thinking in school practices.

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