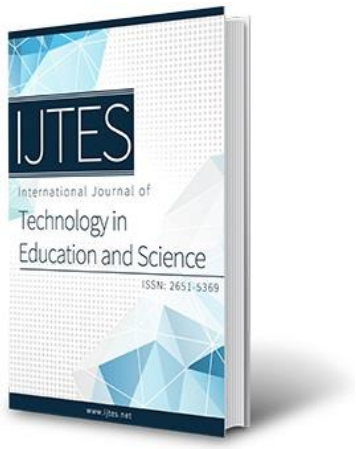

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Online Psycho-educational Intervention in Mathematical Learning Difficulties

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To cite this article:
Wauke, A. P. T., Bedin, L., & Pizzinato, A. (2023). Online psycho-educational intervention in mathematical learning difficulties. *International Journal of Technology in Education and Science (IJTES), 7*(1), 30-56. https://doi.org/10.46328/ijtes.440

International Journal of Technology in Education and Science
2023, Vol. 7, No. 1, 30-56 https://doi.org/10.46328/ijtes.440

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Article Info

Article History

Received:
19 June 2022
Accepted:
20 December 2022

Keywords

Mathematical intervention
Study cases
Language
Semiotics

Abstract

The present study shows the results of six case studies referring to an intervention applied to mathematical learning difficulties. Participants were 8 to 12 years old. The intervention considered mathematics as a language and it is theoretically based on Bronfenbrenner's bioecological model, Vygotsky's sociocultural theory and Peircean semiotics. The objective was to work on the development of academic skills associating mathematics with interactional social skills. The analysis was based on qualitative data collected during the intervention process and quantitative data from scales and instruments with pre- and post-intervention measures. However, due to the COVID-19 pandemic context, some methodological issues were affected, mainly because the evaluations took place before and in the midst of the pandemic. Social impacts of the pandemic have unevenly affected participants, especially adolescents and children. The pandemic had a worse effect on adolescents than on children, especially regarding procedures that involve memory, and those with attentional problems also had worse results.

Introduction

We are social beings and live in constant interactions that can lead to learning and development both as individuals and in society as a whole. Vygotsky (Oliveira, 2001) presents a system of understanding the human being based on social and cultural aspects. Culture is not something ready-made, but a stage of negotiations and relationships, in which information, concepts and meanings are continually reformulated and interpreted. Barbara Rogoff (1993) describes a line of thinking functionally related to problem solving that depends on culture. These are also related to practical and interpersonal goals that may or may not be conscious. There is a relationship that encompasses dexterity, understanding and different perspectives according to the culture of the individual, guiding their values and priorities in resolutions.

Each person learns and develops according to their particular context of experiences, influenced by culture, associated with their individual aspects (Vygotsky, 2009). In the midst of these negotiations and renegotiations of meanings, for an effective interlocution, there must be a minimum of agreement between the meanings of the interacting individuals (Vygotsky, 2008). For people to communicate and exchange messages, they need communication systems, which are created on the basis of symbolic systems, already established in culture.

Camillo (1997) presents a work on these processes of meaning construction applied to the Portuguese language in Brazil. In her work, the author describes that links occur through language, approaching a new view of graphic language in a perspective within Peircean semiotics. Based on this perspective the present study was developed, mathematics as a language present in processes of communication and interaction between people.

In a cultural-historical approach, considering the relevance of mutual understanding in the context of mathematics, a specific "paper" was created for exchanges to be used as a currency. This paper carries an added value that distinguishes it from other papers, enabling purchase, sale, rent, among other commercial relationships. There are categories of values according to the characteristics present in each one of these papers. Likewise, for the value of a given banknote to be used in these exchange operations, it must have the same meaning as the magnitude of the value, even enabling communication to take place in a commercial transaction process even if the individuals involved (i.e. buyer and seller) do not speak the same language. Nevertheless, there is a need for both to have the same understanding of the financial signs involved in the transaction.

The need for mathematical skills and the reasoning behind operations and logical comparisons are part of everyday life. The mind is in a constant process of comparison and decision, analysis of the sequence of steps to carry out activities, which steps are before or after, and so on. Our culture, in general, especially in cities, has values focused on formal and scientific operational thinking, on mathematical thinking and on the practice of reading and writing (Rogoff, 1993).

The process of construction and reconstruction of meanings accompanies us throughout our lives. Vygotsky (2008) states that the first concepts and their relationships are learned on a daily basis and, later, the learning continues at school, which is responsible for bringing scientific knowledge, as it is part of the cultural world. Within this set of learning, construction of relationships with mathematics can occur in different environments through which children transit from birth. The construction occurs in an imbricated way with everyday practices and other areas of knowledge, whether at home, at school or elsewhere. The relevance of the base contents is also highlighted, since, if they are not well sedimented, they can lead to damages that extend throughout the life cycle of an individual, considering, mainly, their cumulative content, being fundamental the work done in the early years.

Bronfenbrenner (2011) presents a theory of a bioecological model of human development, in which is possible to see a Vygotskyan perspective, through a vision of interactional dialectics. The researcher approached a perspective that makes use of categorization in systems of interactional processes that influence and are influenced by the person throughout their life. They are: microsystem, mesosystem, exosystem, macrosystem and chronosystem. Microsystem refers to the most direct interactions: the first influences from child-parents, child-therapist, child-teacher interactions, etc. Mesosystem, in turn, is related to interactions between microsystems, such as, for example, the therapist in intervention with the child's parents or with the school or parents in interaction with the school. Exosystem refers to the person's indirect interactions; for example, a more distant neighbor or parents' work. Macrosystem is related to institutions, legal, cultural and political issues. Chronosystem is a way of presenting the strong weight of effects of time and events occurring over time in the person's development process.

Bronfenbrenner's view also considers the great influence of individual issues, such as biological, cognitive, emotional, and behavioral aspects, providing the basis for the pillars of his theory: Process-Person-Context-Time.

Camillo (1997) describes interactions as opportunities for learning and communication. For communication to become effective, there is a need for communication systems of minimum equivalent knowledge so that there is understanding between members of the process. Such systems are structured through rules for their functioning in these communication processes. The author adds that the bond between people occurs in expression through language as a cultural phenomenon.

For communication to become ecologically effective, Camillo (1997) emphasizes the existence and need for different shared sign systems. These are codified and constructed throughout the history of collective development and in everyday relationships. Considering this communicational basis, Camillo (1997) defines language as a communicative expression in which the sign is the mediator of this process. The sign the author refers to is based on Peircean semiotics (Peirce ,1995). Camillo argues that a sign can be seen as a cognitive mediator or a communication mediator. As a cognitive mediator, it refers to mental representations we have about something. While acting as a communication mediator is related to people's forms of expression. The researcher describes that such expressions may or may not be graphic representations.

Peirce (1984) shows the concept of sign as a triadic relationship between sign (*representamen*), object and interpretant. Santaella (2018) describes that, for Peirce, the sign and the object can be anything, with the sign representing the object while the interpretant is the cognitive processing of this process, the interpretive effect of the sign. An interpretant is a sign evolved from another sign. Peirce (1984) also considers the sign as a social phenomenon. Furthermore, the researcher strongly bases his concept on something dynamic, which is associated with other representations *ad infinitum*, with a strong focus of his work on the processes of construction of meanings, significations. These are updated with each interaction with the object. For Peirce (1984), the sign has the function of representing something to someone and, in this process of mediation, it can represent something, an idea or an object, and it can be something imaginary or not.

Under this approach, mathematics is considered as a language, as a cultural phenomenon, in order to assist in communication between people through codes created to facilitate this interaction, that is, symbols. In the same way, we adopted this conception of the sign as a cognitive and communication mediator. Signs permeate the interactional and learning processes, allowing the understanding of reality and action in the world.

Considering mathematics in Brazil, in a context of communication processes, the rules that govern within the country are predominantly the decimal system. In this way, both the representations of magnitude and the logic that underlie operations and the name of the numbers consider this system. For example, all digits range from 0 to 9 and operations take this factor into account.

Mathematics, as a knowledge of continuous use throughout a person's life, is a content worked in school contexts. Tests or exams are tools used to measure and monitor people throughout their lives. Among the tests carried out,

the Program for International Student Assessment (PISA) stands out, which proposes a comparative assessment among students from schools in the participating countries. PISA is coordinated by the Organisation for Economic Co-operation and Development (OECD). The tests provide data referring to students with complete basic education. The test questions evaluate the application of school contents in everyday life. The evaluation takes place every three years, with a focus on a main axis in each evaluation. Until 2015, the areas evaluated were science, reading and mathematics. Regarding data of the test applied in 2015, McKinsey & Company, an American global management consulting company in which professionals from different areas work, published a report containing the analysis of PISA data from students in Latin America (Dorn et al., 2017).

Brazil has one of the lowest performance indices in PISA compared to other countries, considering some aspects. For example, Russia has a lower health-related score than Brazil, however, its PISA score is higher than Brazil's, with almost 300 points difference (Kirkcaldy et al., 2004). Also noteworthy are the Human Development Index (HDI) data, in which Korea has a low index score in compared with other countries; however, in science and mathematics, it is among the first places in the overall ranking. However, its performance ranking does not guarantee high levels of well-being and life satisfaction, as the country has more than 20% dissatisfaction with life, compared to 4% in the Netherlands (OECD, 2015, 2017). Brazil has one of the worst performance rankings, being below the OECD average, considering that its worst performance is in mathematics (MEC, 2016). In addition, Brazil also has low levels of well-being and life satisfaction (Peiró-Palomino & Picazo-Tadeo, 2018), indicating a need to consider both aspects together.

It seems more logical, in this scenario, a more integrated psychopedagogical action, which considers both cognitive skills and emotional states associated with socioeconomic variables, which both restrict the learning process. The person who has difficulty in performing activities valued by the culture may feel inferior for being considered "different". Difficulties in number skills can be socially and personally devastating over time (Geary, 2013). Therefore, there is a need for interventions, because, from these, it is possible to act preventively in academic learning issues associated with socio-emotional development, in order to re-signify these interactions. Social sciences try to extend the psychology to education. Some researchers (Blanco & Marín, 2007; Martín-Baró, 1998), for example, argue that, when it comes to human suffering, there is no way to maintain neutrality; action is required. Learning disorders can generate suffering. Geary (2011) describes that difficulty in mathematics is more problematic than difficulty in reading and writing. The author reinforces the idea based on daily practice, especially with regard to economic issues. As consequences of this adversity, one can highlight the individual's low self-esteem, school dropout or damage to mental health. Other potential consequences should also be considered, such as the lack of job prospects or growth prospects in the same, which are linked to lower wages. Given the circumstances, it is necessary interventions and preventive actions that act on learning difficulties and offer situations in which exclusion does not occur. Interventions have been presented as a way of working on awareness of tasks and the own difficulty through structured, didactic and systematized information, integrating with emotional aspects (Bäuml J., Pitschel-Walz G., 2003; as cited in Rummel-Kluge et al., 2006).

Returning to the bioecological model (Bronfenbrenner & Morris, 2006), we consider the concept of proximal processes that consist of reciprocal interactions between the bioecological human organism and other people,

objects, or symbols of their immediate external environment. Progressively, these interactions become more complex, so that interventions can act based on two propositions about proximal processes. The first concerns the improvement in the effectiveness of skills, knowledge and performance in engaging in individual activities or with other people. For that, continuous interactions are necessary for a certain period of time. The second concerns the form, power, content and direction of proximal processes in which development takes place. These vary depending on the characteristics of the person and the immediate or more remote environment. The characteristic of the person appears as an element of influence in the process and as a result of the interaction.

The present study aimed to propose, implement and analyze the effectiveness of an individual intervention, whose data can serve as input for a school intervention in elementary school children. The intervention was based on Bronfenbrenner's bioecological perspective, Vygotsky's socio-historical epistemology and Peirce's semiotics (1984). However, during the execution of this study, the Covid-19 pandemic began, as much of the work was carried out in 2020. Schools were closed and remained so during this period. An event that brought about changes in the concentric systems of Bronfenbrenner's bioecological model (2011), which brought historical-cultural changes (Vygotsky, 2009) and the transformations of signs within the Peircean semiotic view (Peirce, 1984). Thus, although the intervention presents a more integrated view, involving issues of well-being and social skills, it was decided to bring the results with a greater focus on mathematics. Additionally, some points are raised for discussion, considering that school activities started to take place in the online mode and this theme is of great relevance. This research began in September 2019 and ended in October 2020.

Given the specificities of the research, a qualitative analysis method seemed appropriate, considering the aim of deepening the understanding of the phenomenon, associated with quantitative data complementary to the understanding. Therefore, the mixed methods approach offers a combination that makes it possible to use the advantage that each method offers. However, due to research biases, quantitative data turned into indicators of academic performance, allowing the analysis along with emotional issues. In order to maintain epistemological coherence, the main authors from the introduction were prioritized for the discussion session.

Method

Design

This was a multiple case study design (Stake, 2011), seeking to investigate the development of children and adolescents with learning difficulties related to mathematics. Participants were between 8 and 12 years old. According to Stake (2011), in multiple case studies, the aim is to study how real cases occur in their respective contexts, so that, later, similarities and differences between the cases can be compared, providing a better understanding of a given phenomenon. The work in question involved clinical work for this understanding. Also as suggested by the author, the idea was to understand each case without seeking saturation. One of the characteristics of multiple case studies is the variability of the cases. Thus, the intervention time ranged from 7 to 12 months, depending on the availability of participants. The average duration of the meetings with child or adolescent participants was 60 minutes. While this average duration with the parents was about 45 minutes, and these occurred as needed. These occurred fortnightly and, later, monthly, to, in the end, became sporadic.

Participants

Participants were selected and came from an interdisciplinary center located at the University and from a private clinic. If the participant missed 3 consecutive meetings, there would be automatic exclusion from the research. The study was an intentional, non-probabilistic sample, according to the range suggested by Stake (2006, p. 22). The case study consisted of six participants, aged between 8 and 12 years, residents of Porto Alegre or the metropolitan region, coming from public or private schools. The proposal was for individuals who have already gone through the basic literacy process, having already been worked with number sense and basic arithmetic operations, but who continued to have difficulties related to mathematics. The criterion for participation was the diagnosis, carried out by partner institutions, the referral was made according to the participant having specific learning difficulties for mathematics. The objective was to better understand the phenomenon (Stake, 2006) in question. Despite the preference for individuals with only math difficulties, no participants were found with only this difficulty. Therefore, all participants had specific learning difficulties for reading and writing. However, none of them had a clinical diagnosis that hindered their participation in the project.

Procedures and Instruments

This study was structured by principles that aim to ensure the privacy of child and adolescent participants, as well as the confidentiality of their information, their families and their teachers. For this, the names of the participants mentioned in this study are fictitious. Personal information was kept confidential and private, and all records were properly stored during the investigative process, in accordance with Resolution 466, of December 12, 2012. After formalizing the evaluation by one of these services, the first author contacted the parents and explained about the work and they agreed to participate, signing a consent form for the parents and the assent form for children or adolescents.

To better assess the results of the intervention, the proposal involved collection with tests and questionnaires in two stages: pre-intervention and post-intervention. Quantitative data on mathematical performance and qualitative data regarding the interventions were collected. Instruments were selected and evaluated based on the epistemological perspective presented as a theoretical framework in the introduction of this study. Tests were applied with existing, validated instruments, but tests were also prepared to evaluate the mathematics signs considering its different kinds of expressions. Thus, the low reliability of the instruments that were not validated is admitted. The instruments used, with their description, are as follows:

a) School Performance Test 2nd Edition (SPT-2) (Teste de Desempenho Escolar 2a. edição - TDE II) – psychometric test that assesses three areas: reading, writing and arithmetic (Milnitsky et al., 2019). For this study, only the subtest that assesses arithmetic from 1st to 5th grade and from 6th to 9th grade was used (Viapiana et al., 2016).

b) Task to Evaluate Content and Form in Mathematics – task designed to evaluate mathematical signs in its different forms of representation. This task considered: interpretation and Arabic written and verbal, oral and

heard numerical signs. Due to the scope of this study and the reading and writing difficulties of all participants, simpler spelling difficulties and errors were disregarded as an error in correction.

c) Coruja PROMAT – works on screening math skills in the early years of elementary school, from 1st to 5th grade. The objective was to check the acquisition of numbering skills and lag (Weinstein, 2016). Some difficulties evaluated were: subitizing and/or magnitude estimation (subitizing is for small sets), retrieval of math facts (memorization of small operations), symbolic representation of magnitude, strategies for solving mathematical problems and numbering system.

d) Arithmetic Task and Complementary Arithmetic Task – a set of tasks was developed, which were applied in a complementary way, with a series of arithmetic problems, to assess understanding of the decimal system and logical reasoning in a sequence of patterns.

e) PISA Questions – assess understanding and interpretation of mathematical problems, only for 7th graders or above.

Also, within the evaluation process, notes and observations of behavior were made at the time of solving the activities, in addition to recording in video and audio. The idea was observing and analyzing behavior in error. Before the beginning of the intervention, data were collected in person with each participant, as well as a sociodemographic questionnaire was delivered to the parents. In relation to children and adolescents, tests related to math performance were applied, in addition to collecting data on well-being, school satisfaction and social skills test. However, the focus of the description refers to mathematics, since it is the main focus of this study.

At the end of the evaluation, an interview was carried out with the parents, in order to investigate the practice of mathematics in everyday life, as well as the development process, in addition to analyzing possible behaviors that could affect learning and also to convey the first guidelines. The decision for this step at the end was purposeful, so that it would not contaminate the first author's view of the child based on what the parents brought. The first guidelines could also be given to them.

After the meeting with the parents, the intervention process began with the children or adolescents. All meetings were recorded on video and audio, accompanied by records in the field diary. Throughout the process, constant monitoring and reassessments were also carried out.

Given the context of the pandemic, much of the intervention and the final assessment were carried out online. Questionnaires were printed, numbered and delivered to the participants' parents. These were instructed before each evaluative meeting on which sheet would be delivered. After the participant finished filling in, the parents kept the sheets at the end of the meeting. This control was performed so that the participant had access to the sheet only when performing the test. After the end of all collection, material of evaluations, notebooks and any other relevant activity were collected.

It was possible to talk to the teacher of only two participants through an unstructured interview. However, she herself describes that she cannot bring behavioral information, as she has not lived with the children. Relevant data from the interview are described in the cases of the participants Valentina and Pedro, given that she was the teacher for both. In the results section, descriptive data of participants associated with the test results are listed in a table. Subsequently, descriptions of each case are presented, with the individual analysis, due to their specificities. At the end, a summary is presented in the final considerations.

Intervention and Context

The intervention consisted of weekly meetings lasting, on average, one hour and daily tasks, for which there was a need to be accompanied by a person in charge. It is important to point out that homework activities were short, around one line or one account only. The tasks involved awareness of magnitude and operations, depending on the difficulty of each case, considering the numerical sign in its various forms of representation.

Additionally, oral interpretation is associated with the interpretation that calculations were problems, analogous to everyday life. Activities involved dictation, reading, writing, manipulation of objects to understand and represent the magnitude and the implications based on the decimal system in the use of mathematics as a language. For adolescent participants who were in more advanced grades, it was possible to work on product, division, fractions and mathematical problems that made use of these operations. Thus, interpretation was worked graphically and orally. These activities were built based on the intervention aimed at reading and writing disorders and dyslexia developed by Camillo (1997), associated with the psychopedagogical experience of the first author, in addition to the analysis of the literature and theoretical foundation of this study. As the participant was more agitated, relaxation techniques were also applied at the beginning of the sessions. These were through quieter music and commands that worked on body and emotional awareness associated with a focus on breathing. The relevance of awareness is highlighted, as this is a central element in the work carried out.

The intervention, which involves the view of mathematics as a language, dealt with issues of different sign formats related to the signification contents they represented. In this perspective, the relationships between numbers through operations were considered, as well as the logic and rules referring to this language, based on the decimal system. Considering it in a contextualized way with reality, through processes close to everyday life with activities with a more ecological focus, such as handling money, time, in addition to the representation of real objects for a better understanding of geometric shapes. The latter was not the main focus of the study, but the recognition of basic shapes was worked on, with magnitude analysis and comparisons between shapes. Socio-emotional issues related to these signs were also addressed.

Autonomy and awareness of the difficulty in mathematics were also encouraged. Understanding and awareness of the difficulty in mathematics was worked through analogies to behaviors because the difficulty in mathematics was present in everyday behavior. In this way, the intention was to bring a re-signification and better understanding of the difficulty in order to work strategies of action towards the problem. As an example, a participant with difficulty in division also had difficulty in sharing objects and people. Another example, other

participants diagnosed with attentional and anxiety issues who performed calculations quickly, with attentional errors, not caused by lack of knowledge about the procedure, but by the rush to finish the activity. Or a kid who still seems to present an inflexibility cognition with persistent errors because insisted at the same form of resolution that was the easiest way, whose mother described the same behavior in everyday life. Guidelines were given regarding these behaviors, making an analogy with mathematics. In the same way, when working on the behavior that reflected the difficulty in mathematics, analogies were also made for the person to become aware of the behavior and to create strategies to deal with them.

After some meetings that, according to the demand for behavior and activities carried out at home, moments of guidance for the parents were marked, considering the very relationship of proximal processes described by Bronfenbrenner and Morris (2006) and the closer action with the family microsystem. The work was done through examples and awareness of the child's behavior, as well as associations regarding the difficulty, with the guidance of an affective and conscious interaction. Likewise, parental actions should represent consequences and not punishments. Important difference for the children to understand that the acts have consequences and not that they were punished by them, in order to avoid generating guilt in their actions.

An average of 276 hours of meetings were held per child/adolescent and around 45 meetings with an average duration of 45 minutes of guidance for parents. Intervention meetings ranged from 7 to 12 months between participants. The variation occurred because not everyone started on the same date. Part of the meetings took place in person and part online. This was because of the Covid-19 pandemic, in which several places were closed, including the places where the attendings were happening. Adaptation to the online mode was because many activities involved handling objects, based on the proposal to work with signs in their various forms of representation. In this way, it was necessary to elaborate activities and with objects they could have at home to be able to explain certain concepts, so that they could handle them without risk. For example, instead of an abacus, they started to use egg cartons with pieces of styrofoam packaging or beans.

It should also be considered that participants viewed the session through a small cell phone screen, whose resolution was not always satisfactory. Consequently, it was necessary to choose the most relevant element to be displayed on the screen, taking into account the difficulty of the participant. For example, if the difficulty was related to writing, then this should be the image captured by the camera, if the difficulty was with the sound, the focus would be on the mouth movements, with slow repetition. Another issue is that because it involves dictation, and sometimes the connection or the audio fails, it was not always so easy for them to understand. It was necessary to repeat it several times and very slowly, considering some hearing difficulties that can be associated to the learning difficulties/disabilities, such as exchanging "sessenta" (sixty) for "setenta" (seventy) or vice versa. In Portuguese, the pronunciation of these numbers name sounds very close.

In the online mode, the number of interruptions and noise in the environment was considerably higher. In this type of meeting, the intervention enters the home of the child or adolescent, literally. However, there is not always the perception on the part of the family that the child or adolescent is studying, so that the daily activities of the house continue, for example, the television is turned on at high volume, people walking around the child, shouting

or side conversations. Another problem arose on hotter days, which required the use of a fan, with noise in the microphone, interfering with communication. In some cases, reprimands with the child or adolescent were made in the middle of meetings. Rarely, the child or adolescent was able to stay in a room alone. Generally, the house did not have a specific room for study, due to the social conditions of the families.

In the initial proposal, an initial interview and final guidelines for teachers were foreseen. However, with the pandemic, barriers to contact emerged. It was possible to interview only one teacher at the end, because it was not possible to contact the others, or they did not respond.

Results

In a multilevel way, a type of mixed method in which quantitative (secondary) data assist in the analysis of qualitative (primary) data, Embedded Design (Creswell, 2013). Secondary data for this case were the data measured and obtained through the following math tests: SPT-2, Content and Form task, Complementary Arithmetic task, Arithmetic task, some items from the Coruja PROMAT and, for some of the participants, PISA questions. On the other hand, primary data took into account other aspects of the aforementioned, in addition to context, type of error, behavior, among other elements that may indicate qualitative elements, as well as other questionnaires related to sociodemographic and developmental issues, in addition to the notes in the field diary referring to the meetings and recordings. Still in this same type of analysis, material such as notebooks, tests and school concepts were also taken into account. Another element considered were conversations with parents or guardians and, in some cases, with the teacher responsible for the mathematics subject.

Regarding the different forms of representation of the numerical sign and elements referring to the understanding of this system, the questions were grouped as follows:

1*) arithmetic (SPT-2 not included),
2*) Arabic signs,
3*) written verbal signs,
4*) decimal system and
5*) logical reasoning (with a greater focus on sequence of patterns).

The results are presented on a scale from 0 to 10, considering the test as a whole. The same element evaluated was present in more than one test, so that the evaluation was carried out on different days to observe the behavior and types of errors. Thus, behavioral records were made during the meetings in the field diary, both in person and in online meetings. These records refer to both tests and interventions. Data referring to collection related to the interpretation was also carried out in a descriptive way together with qualitative data. SPT-2 was considered separately, as it is an instrument existent for a longer time, validated, with categorizations referring to percentiles, schooling and type of school - public or private.

Six participants remained until the end of the work, covering both children and adolescents, with different learning difficulties. However, all of them had some difficulty in reading and writing. The names were changed to preserve

their identity. Table 1 lists data characterizing the research participants. These data are based on the pre-intervention test.

Table 1. Table with Sociodemographic Data

Name	Age	Gender	Type of school	Intervention time	Grade	Family composition	Family income (a)	Education of guardians (b)	City
Valentina	8	F	Public	7 months	4th	Mother, aunt and uncle Father absent	1 to 3	Mother – CHS	Porto Alegre
Pedro	8	M	Public	1 year	3rd	Father, mother and sister	1to 3	Father and Mother - CHS	Porto Alegre
Maria	10	F	Private	9 months	5th	Father, mother, younger brother	5 to 8	Father - IHE Mother - GS	Rural area of Viamão
Isadora	11	F	Public	1 year	6th	Mother Father absent	1 to 3	Mother - CHS	Viamão
Daniela	12	F	Private	1 year	6th	Father, mother	3 to 5	Mother - CHS Father – IHS	Viamão
Vitória	12	F	Private	7 months	8th	Father, mother and older brother	1 to 3	Mother - CHS Father - IES	Porto Alegre

(a) Minimum wage: R$ 954. This data refers to the period before the pandemic because some of them lost their jobs or had reduced income.

(b) – IES: Incomplete Elementary School; IHS: Incomplete High School; CHS: Complete High School; IHE: Incomplete Higher Education; GS: Graduate Studies.

Table 2 shows the main difficulties, results and discussions for each case, among the columns considered, in addition to the participant's name, data that seemed to have stronger influence on the results of the intervention performed were considered.

Table 2. Descriptive Summary of Cases, Results and Discussion

Name	Intervention in Reading and Writing	Literate	Intervention time	Referral	Parents' adherence	Total score - before	Total score - after
Valentina	No	No	7 months	Psychologist, Speech therapist	Only at the end, from the mother	32	67
Context and Main Initial Difficulties	• Disorganized family support, constant absences. Tasks often incomplete or performed incorrectly (despite recurrent repetitions of family guidance). She did not know her father. The one who took her most of the time was her aunt. In the online mode, her mother started to accompany her more closely. She had a low tolerance for frustration with mistakes during activities. • Noisy home environment with no space for activities. • Mirror writing (7 for "F", 3 for "E"), difficulties associated with the connection between numerical representation and magnitude, did not know which Arabic numbers represented verbal numbers, could only say when written in sequence. Marked difficulty in interpretation. • Spatial confusion in object counting. She knew how to write in sequence up to 50, but not randomly. Difficulty tracking reading alignment in tables, difficulty of spatial organization in subitizing processes and calculation representation formats. She did not understand task instructions and was not aware that she did not. Anxiety to resolve before the end of the guidelines. Her knowledge was disorganized. • Very sociable and motivated, easy to bond. • Difficulties in understanding the logic of procedural rules and in logical reasoning. • In the feedback on the severity of the difficulty, the mother said she was not aware of her daughter's condition. However, even after explaining the daughter's situation, absences, incomplete or unfulfilled tasks continued.						
Results	• Improvement began from the moment the child began to carry out activities more systematically at home, with improvements in the learning process. This occurred after a conversation with the child's godfather. • The increase in the interest from the mother began with the role of godfather. The conversation was made to both. Her interest increased even more when she had to carry out school activities with the child. • The child showed improvements in numerical signs, began to recognize numbers without difficulty. She was able to name the numbers,						

				understanding the logic of number naming (she could tell what the next numbers were even without being taught). • The child improved her understanding of magnitude and representation. She came to better understand the logic of numbers, affecting her understanding of sequence. She began to understand the logic of calculations as well. • The score in group 3 declined. This group is related to the verbal mathematical sign (written in full) which may be related to the fact of not having had a class, nor intervention aimed at reading and writing, since she was not literate. • Exercises solved in the SPT-2, post-test, did not correspond to knowledge worked in intervention sessions and qualitative assessments. Suspicion that she received family help, which was not interpreted as totally negative. A similar situation was described by the teacher who said that the child always brought activities done, but she did not know if they were solved by the child.		
Pedro	Yes	No	1 year	Psychologist and Speech Therapist	From both, mainly from the father	43	163
Context and Main Initial Difficulties				• Referenced of low self-esteem, insecurity, withdrawn, not very active, was quite shy, was bullied at school, felt excluded for not knowing how to do the activities and for the attitudes of classmates and the teacher. Motivated, however, with difficulty in logical reasoning, he often said he was confused, mirror writing (he changed 3 for "E"). He did not usually ask questions or clear up doubts in sessions. He reported situations of fear of aggression from classmates and of rain with winds and thunderstorms. • The father always took him and accompanied the whole process, he was very present. The mother worked outside the home and was financially responsible for the house, even working outside the home, the father reported that the mother was present. The father confirmed the report of bullying and said he even went to school to talk to the mother of another child, without success. • At the beginning of the work, Pedro called himself a donkey. When he did not know, he got nervous and scratched his head, he paralyzed and said to be confused. • Usually, Pedro was calm when not doing studies exercises. During the meetings his father seemed to attend his daughter's demands more, who was more agitated. Also, his father appeared to be more affectionate with the girl than the boy. There was a difference in treatment between children. Pedro complained about his father's way and wanted him to be more affectionate, as his mother was, but he also said that he felt no difference in treatment		

	between him and his sister. The time when he received the most attention was when he performed the tasks. • In subitizing activity, he was confused. He had marked difficulty in understanding orientations of the questions. To solve any operation, he counted on his fingers and often got lost. Faced with questions about how he performed the calculations, he withdraws, hiding his fingers. • Difficulty in logical reasoning in general. He also had difficulty with the logic of the numerical sequence and the rules of procedures for performing the calculations, in addition to memorizing such procedures. • Difficulties in expressing himself, reduced vocabulary, seemed to have generalized language difficulties, encompassing speaking, reading, writing and mathematics. • At first, the child appeared to be very tired and sleepy, there was no routine or schedule. In conversation, the child reported that the father stayed awake, playing at night.
Results	• After guidance on routine, there was a relative improvement in Pedro's disposition and in his learning. His performance was different, his memory and attention improved. These aspects helped in raising awareness of the father, in maintaining the organization of studies. • As for the total score of all tests, comparing the pre- and post-intervention tests, from 43 it increased to 163, an excellent response to the intervention. His evolution showed change of numerical signs. He came to understand, name and acquired the logic for numerical construction. • He was able to understand the logic of number construction and was able to write numbers that he had not yet learned, these above a thousand. He knew the Arabic number that represented the corresponding the verbal and vice versa. Dictation activities were carried out to raise awareness of the number sign. • The father constantly tried to put the guidelines into practice, in addition to uninterrupted follow-up. The father noticed that his son's improvement was clear. Communication issues were also addressed between the two. Pedro described that his interaction with his father had improved. • Performed tasks systematically. The father accompanied him to all sessions and was committed to the son performing the tasks. • At the end of the intervention period, Pedro was more self-confident, said he knew how to do activities, there were no more moments in which he claimed to be confused, nor did he call himself a donkey. • Autonomy and incentives were worked on when he performed activities,

					regardless of whether they were right or wrong. The idea was to re-signify the learning process for him to regain self-confidence. After the intervention process, he also showed more autonomous and proactive behavior. • The logical reasoning of signs related to proportions, comparisons and operations through geometric figures was worked, considering that concepts used in mathematical signs do not need to be limited to numbers. There was a noticeable improvement in logical reasoning, even visible in the test results.		
Maria	No	Yes	9 months	Psychologist and Speech Therapist	Partial, only from the mother	176	184
Context and Main Initial Difficulties					• The mother who took her to face-to-face meetings and also organized the online ones. When in person, the guidelines were directed only to the mother, who said she was overwhelmed by having to take care of everything alone. • The mother described that the child started schooling at 5 months of age, remained until 5 years of age. She also reported that, during this period, the teacher complained that the child, when compared to other children, took longer to finish activities. Leaving her without a break so she could finish her activities. • In the online sessions, the childish treatment that the mother had with her daughter was noticeable. She used diminutives and did some activities for her. • In addition to specific learning difficulties, Maria was also diagnosed with generalized anxiety disorder and dysgraphia. • At the beginning of the online meetings, there was an attempt to include the mother's help. However, she kept correcting the child at different times, not letting her finish the activity. Thus, we opted to work only with the child. • During the pre-intervention evaluation, she missed several questions for details in calculations due to lack of attention. For example, changing "-" to "+" and vice versa. Activities carried out quickly with the intention of finishing soon. • In one of the online meetings, parents criticized her for not being ready, for taking too long to get organized, saying that she was not interested. • Frequently, during the meetings, she apologized for the messy room, for the scream of her little brother or for the barking of the dogs. When the mother organized the child's room for the meeting, at various times the child mistreated the mother, asking her to leave soon. • For online guidance, it was possible for both parents to participate. • Behaviors more immature due to age, she did activities with little motivation,		

					agitated, hurried, without care as something unimportant. She said that she wanted to play. She had a low tolerance for frustration.		
Results					• She was more irritable in the assessment activity, crossing out questions that were left blank. Such questions required more attention or more time. However, some of these questions had already been taught the content and the participant managed to solve in previous meetings. Her tolerance for what she did not know became more noticeable. The act of crossing out seemed to represent a cancellation either out of impatience or not knowing or not remembering. • In terms of context, the post-test period was one of the most troubled, given that her mother had constant work meetings and was taking a course. In that moment she felt more overwhelmed than she ever used to describe before. • Awareness of the daughter's childish behavior was worked on and guidelines were given, considering that these seemed to be affecting the children's learning. • Few behavioral guidelines were put into practice. The mother said that she did not understand her daughter's behavior and the father said that he did, but he did not take any action. Tasks performed were almost always done; however, Maria herself said that sometimes they were done on the eve of the meeting, different from the orientation to be daily. The cases of greater number of errors in the tasks, when investigated, seemed to be related to these moments of performing a condensed task and that there was greater disorganization at home. • Relaxation practices were developed as a form of guidance for the mother, but she did not put them into practice. • There was little increase in the score, which seems to be related to low parental adherence.		
Isadora	Yes	Yes	1 year	Psychologist	From the mother	125	154
Context and Main Initial Difficulties					• Motivated, affectionate and lacking in affect. Agitated behavior, attentional difficulty, more emotionally immature compared to other children of the age, emotional, performed activities in a hurry to finish soon (it seemed something like: done). She created her own rule for solving tasks, did activities without acuity, in a disorganized way. She was more rigid during the intervention process. After the procedure, she did it correctly and said she understood, however in later meetings she returned to her usual resolution, sometimes she said she understood but did it with the old resolution form. When describing her behavior to her mother, she said the same attitude was used with household activities: she did the assigned task anyway, in a hurry,		

	even though it was explained what was to be done. • The mother took her to all sessions. She was raising her daughter with the support of her mother, Isadora's grandmother, and her boyfriend. She had to go to court for her father to assume part of the paternity. In parallel to the research assistance, focused on mathematics, she also had professional support, with a focus on reading and writing. • Diagnosis of attention deficit and specific learning disorders with impairment in reading and writing and mathematics. • During the pre-test evaluation, there were noticeable difficulties not only due to attentional issue, but in calculation procedures such as addition, subtraction, multiplication, and division. Sometimes the child confused 'x' with '+' or '-' with '+'. There was no spatial organization, with confusing handwriting, sometimes not understanding what she was writing. She often miscalculated due to this factor. • She also did not know to write Arabic numbers higher than thousands, confusing thousands with hundreds. • During the intervention process, addition and subtraction procedures were worked on and the multiplication procedure was started. • As soon as work started, she had a habit of sucking her thumb. With time and awareness, the behavior stopped. However, with the pandemic and isolation, she sucked her thumb again. Even during the pandemic, her mother reported that her daughter started to get sad more easily and started to eat a lot. In the period of the pandemic, Isadora's mother lost her job and the teenager said that her mother was fighting with her more frequently.
Results	• In the post-intervention test, during the assessment, the child did the activities quickly. However, from the video call image, it was not possible to see many details. At the time of correction of the test, there were several errors that were only attentional, unlike the period of the meetings, in which she used to get it right, and the pre-test evaluation, in which errors were found due to lack of knowledge of procedures. In the qualitative evaluation, she showed improvements, but in the quantitative one, not so much, due to attentional errors. There was an improvement in the quality of the resolution of the questions. • She showed improvement in behaviors related to home and school activities. She started to ask more what was to be done. She became more aware of her difficulty in carrying out activities with greater awareness. • Regarding her process of awareness of mathematical signs, in qualitative terms, showed improvement in all groups. However, in quantitative terms, the greatest improvement occurred in the Arabic representation grouping.

					Before the intervention, she did not know what the representations were for numbers above 1,000. After the work, she began to better understand the logic of building these numbers, knowing how to write and identify them. • In a closing meeting, her mother reported that before the intervention, Isadora could not count money or give change and that now she could. She also reported that, before the intervention, she had no idea about the price of products and that now she did. In qualitative terms, her self-consciousness was noticeable after starting the intervention, as she previously said she did not notice her agitation or recognize errors when reviewing her activities. • Part of the attentional problem improved with the practice of relaxation, but the mother was not always consistent in doing it on a daily basis. Although when these practices were done more frequently, she presented better results.		
Daniela	No	Yes	1 year	Psychologist	From both parents	217	251
Context and Main Initial Difficulties					• The father and mother who took the teenager to the sessions. They were united, married, and very present parents. They were very grateful for the intervention, as the mother had been trying to resolve her daughter's situation for some time. Daniela started the intervention in 2019. It was possible to notice differences between before and after the pandemic. In 2019, she was happy, arrived motivated at the sessions and was very affectionate. It was noticed that, due to her characterization associated with the difficulty, she performed the activities more slowly. Her resolution strategies took longer. She reported being happy to be doing the work and being able to learn. • Low self-esteem, affective, interested and motivated, hardworking and dedicated, accentuated difficulty with interpretation problems. • In an anamnesis, Daniela's mother reported that her friends were not willing to do group work with her and that the friends' mothers themselves advised them not to work together. • It was possible to advance in terms of content due to its ease of learning with the intervention. She was hardworking and dedicated, and when she could not get things done due to disorganization, she was oriented towards organization through an agenda. She had difficulty in reading and writing, but had follow-up with this focus before the pandemic. During the pandemic, she was very anxious, tired and even more aggressive, mainly because classes started to take place in the online mode and the amount of activities that the teachers were asking for. She claimed to feel overwhelmed, said she had to study all the time because of the number of activities. Often, she did not understand the classes and could not answer questions, as the time available for clarifying these was limited. Daniela		

					claimed that she kept doing the assignments as much as she could and that she did not want to fail. Despite therapeutic referral, the family took a long time to start the search. In some sessions, school contents were worked on to help her in this overload. Some sessions had to be rescheduled, as the school passed the class schedule on the same day, with alternating classes in the morning and afternoon. In some cases, the class time coincided with the meetings.		
Results					• When she was more anxious, relaxation work was applied with breathing and music, so that she would calm down, which produced a visible change. On busier days, she tended to talk all the time and had difficulty concentrating to perform activities. After relaxation, her speech slowed down, she started to pay attention and said she was calmer. • As it has more visible effects regarding the pandemic and the school situation, manifested even by the participant herself, the presentation of qualitative results as described by the participants are divided into two stages: before the pandemic and after the pandemic. Before the pandemic, Daniela was enjoying her progress, she said she was improving at school, not only in math, but in other subjects as well. In 2019, she said she was at risk of failing and at the end of the year, she managed to pass grade with scores she considered good, above average. She related this to the interventions. Her mother stated that her daughter's improvement in reasoning was noticeable. The mother was very perceptive about her daughter's situation. After the beginning of the pandemic, Daniela's memory declined, so that she could not remember the procedures for solving calculations. This became noticeable during the sessions and the post-intervention test, mainly by group 1 (calculations). In this group, there was little improvement based on what was worked on and on Daniela's learning, as perceived during the meetings. However, both group related to the decimal system and to the logical reasoning showed significant improvements. • She had greater difficulty in understanding math problems (relationship with reading difficulty, which had an intervention interrupted due to the pandemic). In the post-intervention test, she managed to solve some questions from the PISA test, unlike the pre-intervention test. Regarding the improvement in her daughter's reasoning, the mother noticed an improvement in practical everyday things, such as a recipe her daughter prepared, and she could calculate according to new proportions.		
Vitória	No	Yes	7 months	Psychologist and Speech Therapist	Very low, from the mother	238	222

Context and Main Initial Difficulties	• Hand count, insecurity. Anxiety and haste, difficulty in interpreting mathematical problems, memorized procedures, with a pandemic, her memory was affected, and she could not remember the procedures. • The mother who always took Vitória to the meetings. Her parents were married at the beginning of the process. However, in a certain period of the intervention, they separated, and the mother went to live in another house with the kids, reporting that the father drank. After about 2 months of separation, the mother and father moved back in together, which coincided with the beginning of the pandemic. • The greatest difficulties in mathematics were manifested in solving problems and some arithmetic and geometry operations. Vitória felt insecure about school and was at risk of failing. In the pre-intervention evaluation, more anxious behaviors were perceived, of wanting to finish the test soon. At each test performed, when it was over, she repeated: "— Done!". • She studied in a denominational school, with a scholarship. The mother described her daughter's tendency towards dependency behavior and that she was not used to "bother" in behavioral terms. Observing Vitória's posture, it was possible to perceive that the teenager had a tendency to accept everything her mother said, without questioning her. The mother complained that her daughter did not do anything without her asking to do it, that there was a great dependence, and she did not have the initiative to solve things. After a few meetings, the mother's behavior of rushing her daughter to leave soon was noticed. The girl seemed to have difficulty exposing or identifying what she felt. • At a certain point in the intervention process, the mother reported the devaluation of her daughter when she earned something or for the things she had, as if she did not value their cost. Practical guidelines were given to analogize the context of home as a job, in order to promote a re-signification of the value of things, a way of trying to change the sign *money*, what it represents and its meaning.
Results	• At the end of the intervention, in an evaluation meeting with the mother, she reported that the daughter started to have more autonomy and noticed an improvement in the value of money and what she earned from her mother. She also felt that her daughter was questioning more her decisions. However, the mother was advised that this questioning was good, because she was thinking and developing a personal opinion, mainly because she started to tell her mother what bothered her and, soon, she began to express herself more. • After the pandemic, the mother noticed changes in her daughter's behavior,

such as: anxiety, exaggerated fear in situations where there was no risk, she was more tense, apprehensive, ate excessively, with skin problems (which she poked until she was injured), more compulsive acts, inattention, and distraction with ease. The mother still recorded: bad mood, unhappiness, sadness, and a more depressive state.

- In terms of results in mathematical tests, in its post-intervention assessment, she showed improvement in logical reasoning regarding group 5. However, in activities more related to memory, there was a drop in performance, especially those related to arithmetic operations involving memorization of procedures, like group 1 and SPT-2. This same difficulty was noticed during the sessions. Victoria could not remember some procedures. The worsening in issues related to memory may be related to her emotional difficulty during the pandemic.

Discussion

Overall, the COVID-19 pandemic appears to have had the greatest impact on older children or adolescents. It was seen by their lack of motivation and the complaints about the amount of workload and fatigue, same as described by Niemi and Kousa (2020). As a hypothesis, in addition to the socio-emotional issues associated with age, the more advanced grades have a greater number of activities, and a retention of socialization demands. At the same time, schools related to the initial grades seemed to show more understanding about children assesments' demands.

Table 2 shows if they were getting intervention in reading and writing, if they were literate, the time of intervention, to which professionals the referral was made, the level of parental adherence and the scores. This information is relevant because the fact they have gone through the literacy process does not guarantee that they are literate. As for referrals, the need for psychological follow-up was perceived in all participants, additionally those who were instructed to seek a speech therapist had a more accentuated language problem. Also due to the pandemic, some emotional weaknesses were accentuated, so that the initial referral of some schools to evaluation and intervention was quite accurate, as the pedagogical support was fundamental, but it did not eliminate background emotional issues as seen in this research and from others authors (Bhatnagar & Many, 2022). Regarding parental adherence, it also provides relevant information, as the consistency in monitoring activities outside the meeting hours was also a relevant factor for better results. Regarding the scores, they cannot be compared between the participants, except for those who were not literate, as the selected tests were individual, according to the difficulty and level of knowledge.

Participants who had consultations in parallel with a work focused on reading and writing showed better progress. This seemed to favor problem solving, the interpretation of what is said, and the number verbal writing. At the same time, the research took place during a pandemic period, which resulted in several interferences. One example was the fact that schools were closed and the assistance center which worked with reading and writing was closed.

The intervention proved to be more effective when the child was literate and able to write numbers in full, mainly because we consider this as another form of sign expression. Another form of numerical representation, considering that in the proposed activities there was the writing of oral signs. For the participant who could not read/write, the graphic verbal sign was excluded from the activity. In one of the cases, the activity was inserted, because throughout the research the participant went through a reading and writing literacy process. In this case, it was possible to perceive the optimization of the work with mathematics after the insertion of oral signs. Considering Bronfenbrenner's bioecological theory, the school-child microsystem and/or the child-professional microsystem that worked on reading and writing had repercussions on the learning related to the work of the research microsystem, characterizing a mesosystemic example (Bronfenbrenner, 2011).

The interventions, which used to be face-to-face, took place in a non-domestic environment. After switching to the online mode, these began to take place in the participants' own homes. In this way, we researchers "entered" into their house, a situation which made it possible to access other data, such as family dynamics. In one of the cases, it was possible to observe the moment when the parents belittled the child for their difficulty in organization. This kind of parents' behavior didn't help the child. The criticism during her moments of studying seemed to increase the kid's lack of motivation, thus, the moment of playing represented a moment of freedom for the child. This type of complaint seemed to contribute for the kid to be in a rush for the studies, as mentioned before in Maria's case. In others, there was the confusion of the moment, the noise in the house and interruptions, with the family stressed with the pandemic or being indifferent to the moment of the child's study. On the one hand, going inside the participants' homes brought rich information in terms of context and family system factors that can harm or favor the child's learning. In a performance view, it can be said that it affected the intervention effectiveness. Given the relevance of proximal processes presented by Bronfenbrenner, having weekly meetings may also have been a factor of improvement in the development of participants. It is also considered the change of meaning of signs with each interaction within the semiotic processes presented by Peirce (Camillo, 1997). In the same way, it was noticed that guidelines for parents also helped in this re-signification, bringing a connection between the use of mathematics and daily life.

There were participants who, despite having already gone through the literacy process, were not literate, neither in reading and writing, nor in mathematics. Two of them even could not recognize the numbers randomly. After the intervention, they began to capture the numbering logic, both in recognizing and writing numbers, even non-sequential, including numbers greater than those worked on in the meetings. This was the case with Pedro and Valentina. Although Pedro's case appears to have a major language problem, Valentina's development process was slower. By hypothesis, the microsystems of both presented a difference, so that Pedro ended up having more support. Considering the microsystems within the bioecological model (Bronfenbrenner, 2011), in the family microsystem, Pedro's father showed greater adherence, greater constancy and organization. Pedro also had the parallel support of another microsystem focused on reading and writing, unlike Valentina, whose mother did not even look for it. Pedro also had more intervention time. However, when comparing the same period of intervention time, Pedro still had a faster development. Within Valentina's development process, greater evolution was perceptible due to changes in her micro and mesosystem. When her mother increased her adherence, both constantly and performing tasks on a daily basis and for interest (change in her family microsystem), her learning

began to evolve. Apparently, this change seems to have occurred after awareness of the child's godfather, who started to charge more to the mother. Also, the teacher started to send activities and the mother had to solve them with the child. This change in the mother's posture can be described as a re-signification of the daughter's sign of difficulty, which means what the sign represented to the mother. As Peirce (1984) presents, thought is action, the change reflected in the mother's behavior.

All these processes of improvement in the mathematical sign, in its representation, can be seen as processes of re-signification, bringing changes in communication, as also presented by Camillo (1997). As presented by the author, the awareness of the sign in its various forms of representation. By hypothesis, it is possible that for those who had more accentuated attention difficulties, the format of the intervention in relation to the format of the test may have affected the way they solved the questions. As the case with Isadora and Maria. Both presented attentional problems already in the pre-test, such behavior worsened in the chronosystemic period of the pandemic. The test sheet had several questions, which seems to have caused more anxiety either because of the number of questions or because it was a test. During the meetings, activities were carried out one by one. The ideal would be to deliver a sheet with several questions for the participants to solve during the meetings. From the video image, it was not possible to identify the nervousness in the face of the evaluation. Another suggestion for schools would be to carry out tests in a separate place from the rest of the class and hand in sheets with fewer questions, little by little.

The pandemic also brought interferences that emotionally affected the participants, more strongly the adolescents, as in the case of Vitória and Daniela. Both had little change or drop in calculation-related group. Emotional issues seem to affect memory more, causing an overload and consequently affecting the execution of arithmetic calculations. An example of a change in the chronosystem that permeated all other systems, including bringing dialectical repercussions with changes in the person. We can associate this element with the Bronfenbrenner chronosystem, which refers to these events or changes over a period of time that affect people's lives. Likewise, a socio-historical alteration in humanity, as already described by Vygotsky, with individual and collective alterations. It can be seen that the socio-emotional issue of this period had an impact on learning. The most visibly affected element was more explicit in activities associated with memory, such as performing procedures in group 1, which is related to arithmetic calculations, and SPT-2. In general, it was the group with the lowest evolution. In some meetings, relaxation exercises were performed before the consultation, with guidelines for parents to put into practice in their daily lives. When there was consistency in such practice, the level of mental organization and execution of activities were better.

On the other hand, group 4 showed the best results. This group refers to logical reasoning and understanding of rules of the decimal system, both in writing numbers, even if they have not learned them, and in performing simpler calculations. For the illiterate, there was a great improvement in the identification and writing of numbers, including those which they did not learn yet. Part of the data collection should be carried out with the participants' teachers. However, with the situation of school closures during the pandemic, teachers were not available in schools, and it was not possible to contact most of them. It was possible to meet only one teacher who taught two participants. However, she could not describe the behavioral information, as the schools were closed, and she said

that she never had face-to-face contact with her students. In terms of performance, the teacher said she was aware of the difficulties, but was unaware of the children's general condition, so the situation was described, and she was guided as to how both of them learned. She reported that she gave them more streamlined level activities compared to the rest of the class. Another issue that drew attention was that both children passed the grade, despite not having enough knowledge to follow the 5th grade content. The teacher's report was that this had been the orientation of the Secretary of Education, that no one would fail in the pandemic year.

Most of the participants were part of the vulnerable population, the sessions were viewed on their low-resolution cell phones. At times, the internet was unstable, preventing the service from taking place that day. There were also situations in which the participants did not have money to pay the internet bill or it had been disconnected. Likewise, they had no way of paying cell phone credit for a video call. Another issue to be highlighted is that the intervention proposal was through the use of various meanings, considering the different forms of representation of the numerical sign. This situation brought challenges, such as the need to adapt the tactile process, constant repetitions to carry out activities due to the instability of the internet, which affected both the image and the audio, among others.

In this line of trying to be careful with the post-intervention collection, even with the separation by envelopes with numbered sheets and guidance to parents may not have been enough. In one of the cases, the child solved the test by being far beyond what they presented to know in the sessions and what they had learned. Thus, it is suggested to take pictures of the evaluations or display them on the video for later "print", so that the image can be recorded following the test execution. People who had attention difficulties, with greater anxiety, had a difference between the qualitative and quantitative assessment results. An orientation due to the attention factor was that the resolution of the problem was followed aloud. In this way, it is suggested that they can carry out school assessments in individual rooms where they can speak aloud, without disturbing other students. This adaptation, in a view of language based on Peircean semiotics (Camillo, 1997), is related to a new form of representation of evaluation more oriented towards those who have attentional problems. It is noteworthy that if these orientations were done during the intervention. Another point to be highlighted here is that none of the participants used medication in most of the intervention process. Only Isadora started working with an anxiolytic medication, but in the 2nd month her mother interrupted treatment due to lack of financial resources.

The implementation of this research was somewhat challenging. A pandemic is not a routine prediction to make. Despite the first author's clinical experience in the area of intervention, this was face-to-face and carrying out the work online associated with a pandemic and its consequences were new. Nevertheless, even considering the global situation, the work was promising, with significant improvement, in a qualitative view, in all cases.

For the post-intervention test, the challenge became more significant because, in a face-to-face data collection, activities can be better guided, so that the focus is more on mathematics assessment. Furthermore, in a face-to-face meeting it is possible to capture the perception of the environment in 360 degrees, unlike on a computer screen. Some assessments had to be repeated because they were filled in wrongly, a factor that can influence the learning of the test. In the online mode, guidance and follow-up are not possible, as only what is captured by the

camera is observed, which is the participant themselves. Still, the person's vision is partial and sometimes the image is cut off as the camera focuses.

Thompson and McDowell (2019) describe about the findings from other researchers describing a similarity effective between face-to-face and online classes. In spite of the fact of that, considering individual attendances, the results were better in face-to-face meetings than online. However, there was a pandemic during the research which means it is important to consider emotional issues about the disease, all social interactions were restricted, the loss of jobs in some cases and all fear related to the situation. In addition, in Brazil online classes were not common. As a consequence, teachers and students were not used to this modality and were not prepared for it, considering material resources or the needed skills. Also, the authors described the importance of reading skills and self-disciplined behavior for the success of the online classes, which was not the case, given the fact that all participants struggled with reading problems, and they came from disorganized homes as could be seen in the cases description.

Conclusions and Recommendations

This study also reinforces the importance of qualitative assessment not only in future research, but for the context of the classroom, as various information described here and used for analysis were collected in a qualitative way, regardless of the pandemic context, as these are very rich. Qualitative data provided a greater depth of understanding of each case, even if in quantitative terms it seemed the same between cases or worse results after the intervention. It was possible to better understand the basis of the difficulty, providing a direction for the real difficulty of the participant. Also, the difficulty is not only linked to content. Changes in behavior or in the organization of the house can positively affect learning, accelerating it.

This research proves to be relevant in understanding the context beyond school, not only in a pandemic situation, but in general, this work looks at each student individually, considering their difficulties and limitations based on their family microsystems, their socio-emotional aspects and their possibilities for evolution. A vision beyond the cameras. This study also presents the possibility of visualizing mathematics as a language, considering its expressions in everyday life, in addition to the possibility of an individual online service work, considering intervention and tests.

The experience proved to be quite valid and the online service proved to be a complementary possibility covering reach without borders, mainly spatial. However, its limitations are perceived, especially in terms of human connection. The video call takes away the possibility of seeing the other closer, of having more connection and the hug, which makes us so human. Feel and perceive elements that cannot be captured by a screen.

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