

## *SEA-ING* INTO HUMANSCAPES AND EQUAL LIBERTY. THE SOCIOCULTURAL-ECOLOGICAL RELATIONS INTO MATHEMATICS EDUCATION

*SEA-ING* EN LOS PAISAJES HUMANOS Y LA IGUALDAD DE LIBERTADES. LAS  
RELACIONES SOCIOCULTURALES Y ECOLÓGICAS EN LA EDUCACIÓN MATEMÁTICA

*SEA-ING* PELA PAISAGEM HUMANA E IGUAL LIBERDADE. AS RELAÇÕES  
SOCIOCULTURAIS-ECOLÓGICAS NA EDUCAÇÃO MATEMÁTICA

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### ABSTRACT

There are bottom-up movements imbued with different praxis into mathematics education, which promotes the combination of heterogeneous values – inserted in social participation, cultural diversity, and reconnection with the Pachamama. Such movements have been developed by collectives of thinkers constituted by members with the most diverse knowledge. Embedded in a counter-colonization resistance by a persistence of the horizontality into the educational process, this paper aims to dialogue around sociocultural-ecological connections experienced in processes of critical ethnography developed in community mathematics education of ascending movements in Brazil and Portugal. The aim is to promote a path in which an old necessity to share the human topological ontology constructed and reconstructed in five different ethnographic fields, in which both the humanscapes and the equal liberty, *sea-ing* in indissociable lines, evidenced the oppression of schooling mathematics knowledge over the sociocultural-ecological human relations. Such *sea-ing* motion is proposed as an alternative path to demystify, re-signify, or only complement, the how human being perceives itself in its surroundings and brings for the most diverse mathematics education processes – formal\_informal\_non-formal, the importance of the situationality of the apprentice as well as the relevance of the intellectual justice towards equitable societies.

**Keywords:** *Sea-ing* Motion Perspective; Humanscapes; Equal Liberty; Human Mathematics Relations; Counter-colonization of Mathematical Knowledge.

### RESUMEN

Existen movimientos de abajo hacia arriba impregnados de diferentes praxis en educación matemática, que promueven la combinación de valores heterogéneos – insertados en la participación social, la diversidad cultural

y la reconexión con la Pachamama. Tales movimientos han sido desarrollados por colectivos de pensadores constituidos por miembros con conocimientos diversos. Inmerso en una resistencia contracolonizadora por una persistencia de la horizontalidad en el proceso educativo, este artículo busca dialogar en torno a conexiones socioculturales-ecológicas experimentadas en procesos de etnografía crítica desarrollados en la educación matemática comunitaria de movimientos ascendentes en Brasil y Portugal. El objetivo es promover un camino en que una antigua necesidad de compartir la ontología topológica humana construida y reconstruida en cinco campos etnográficos diferentes, en que tanto los paisajes humanos como la libertad igualitaria, *sea-ing* en líneas indisolubles, evidenciaron la opresión de la escolarización del conocimiento matemático sobre las relaciones humanas socioculturales-ecológicas. Dicho movimiento *sea-ing* se propone como una vía alternativa para desmitificar, resignificar o complementar la forma en que el ser humano se percibe en su entorno y trae a los procesos más diversos de educación matemática – formal\_informal\_no formal – la importancia de la situacionalidad del aprendiz y la relevancia de la justicia intelectual hacia sociedades equitativas.

**Palabras clave:** Perspectiva de Desplazamiento *Sea-ing*; Paisaje Humano; Libertad Igualitaria; Relaciones Matemáticas Humanas; Contra-colonización del Conocimiento Matemático.

## RESUMO

Existem movimentos de baixo para cima imbuídos de diferentes práxis na educação matemática, que promovem a combinação de valores heterogêneos – inseridos na participação social, na diversidade cultural e na reconexão com a Pachamama. Tais movimentos têm sido desenvolvidos por coletivos de pensadores constituídos por membros com os mais diversos saberes. Inseridos em uma resistência contra-colonizadora por uma persistência da horizontalidade no processo educacional, este artigo visa dialogar em torno de conexões socioculturais-ecológicas vivenciadas em processos de etnografia crítica desenvolvidos na educação matemática comunitária de movimentos ascendentes no Brasil e em Portugal. O objetivo é promover um percurso no qual uma antiga necessidade de compartilhar a ontologia topológica humana construída e reconstruída em cinco diferentes campos etnográficos, em que tanto as paisagens humanas quanto a igual liberdade, *sea-ing* em linhas indissociáveis, evidenciaram a opressão da escolarização do conhecimento matemático sobre as relações socioculturais-ecológicas humanas. Tal movimento *sea-ing* é proposto como um caminho alternativo para desmistificar, resignificar, ou apenas complementar, a forma como o ser humano se percebe em seu entorno e traz para os mais diversos processos de educação matemática – formal\_informal\_não formal, a importância da situacionalidade do educando bem como a relevância da justiça intelectual para sociedades igualitárias.

**Palavras-chave:** Perspetiva da Deslocação da *Sea-ing*; Paisagem Humana; Liberdade Igualitária; Relações Matemáticas Humanas; Contra-colonização do Conhecimento Matemático.

## INTRODUCTION

“... *A raiva dá pra parar, pra interromper*  
*A fome não dá pra interromper*  
*A raiva e a fome é coisas dos home*  
  
*A fome tem que ter raiva pra interromper*  
*A raiva é a fome de interromper*  
*A fome e a raiva é coisas dos home ...”*

(Bosco & Blanc, 1976)

Humanscapes have been socioculturally constructed and economically structured in the dichotomy between democracy and citizenship around the world, since classical antiquity, sustaining itself in constitutive plurality in its own diversity. In Europe, the Treaty of Maastricht, signed in 1992, challenging all Marxist logic, proposed establishing a political unification via an unified economic system, unifying the unifiable. Such political-economic context proposed both the promotion of cultural violence among the different sense of life present in the selected countries to be part of, as the explicit establishment of the part of European non-part. On the other hand, in South America, the resurgence of totalitarian governments has hindered the possibility of creating a continental circular economy, while has promoted the extermination of original ethnocultural groups and, with them, the continental ecological decline – after all, the original peoples have revealed as the guardians of biodiversity in this continent (Krenak, 2022). So, the contradictions highlighted in these contexts between nations socioeconomic power, cultural groups, political classes, environmental rights, and popular expressions have spoken louder. In fact, current images and actions (Mills, 1959) are haunted by the search for a paradigm in which cultural pluralism is constitutive in the human relations.

Immersed in this counter-order, there are bottom-up movements imbued with different praxis (Freire, 1970), which promotes the combination of heterogeneous values – inserted in social participation, cultural diversity, and reconnection with the Pachamama, which have been developed by collectives of thinkers, themselves constituted by members with the most diverse knowledge. Within this counter-ordering resistance, under the exercise of the counter-colonization of the mathematics knowledge, this paper aims to dialogue around some sociocultural-ecological connections experienced in processes of critical ethnography on community mathematics education – core theme, or the kick off, of some ascending movements in Brazil and Portugal.

In fact, this paper responds to an old necessity to explicit the human topological ontology constructed and reconstructed in five different critical ethnographic fields, in which both the humanscapes – here developed, and the equal liberty – as denominated by Balibar (2011), *sea-ing* in indissociable lines, evidencing the oppression of schooling mathematics knowledge over the sociocultural-ecological human relations.

Such movement – *sea-ing*, developed by Ingold (2011), is proposed as an alternative path to demystify, to re-signify, or even only to complement, the how human beings perceive their surroundings. In this paper, this movement has the same proposed to the mathematics education studies, focusing the how the human beings perceive their production relations, rooted to social, cultural, and ecological contexts. To develop a perceives path is to stimulate the sense of belonging, and, as the human is a social being (Restivo, 1983), is necessary to propose a collective construction - a co-construction, then “any study of human beings must also be a study with them” (Ingold, 2011, p. 239).

To Ingold (2011), the way of being is a premise of research which accepts and enhances the diversity of dialogue to enter the world of each one’s dreams, designing in synergy the way of thinking

and acting in the world and towards the world, not judging the truth of the propositions shared but working on the understanding of their signify and significant, accordingly to the context in which it is manifested. The perception of the importance of being attentive to what and who is around with intention (Ingold, 2022). Having the intention of being attentive to others is the rudder of the *sea-ing*, making this movement a motion – in a displacement sense, of the physical, social, and intellectual human bodies to exercise the sense of belonging to the environmental context where the human is and, with that, to achieve a worldview about the holistic movement of nature and the sense of completeness and dependence of all life on it.

## WAVES OF CRITICAL ETHNOGRAPHY: WHY?

With the aim of feeling the waves, where there is *sea-ing* through the study of community mathematics, this article proposes the use of a critical ethnography methodological boat (Thomas, 1993). On the proposed boat have space for many humans and have condition to *sea-ing* to the deep ocean that is in each one of them. The relevant waves, here, are the sociocultural-ecologically experienced in some community mathematics education' seas. Brazil and Portugal were the main pioneered seas, and to do the exercise to *sea-ing* motion in diversified lands, finding the plurality intrinsic in each of them, empower not only the knowledge of each sea, but the co-constructed knowledge from the *sea-ing* motion perspective on it, the own elected methodology evidencing its consistence and flexibility necessary to *sea-ing* with the other, and the sense of belonging as part of a whole.

The critical ethnography cases, here shared, are presented in the organicity those all contain themselves, showing not only the distinct human mathematics relations but the different ways in which the critical ethnography can be developed in favour of the *sea-ing* motion. In fact, instead of remaining in the data collect and analysis of a critical nature, the option for a resolute nature in retracing the path from the beginning of mathematic knowledge colonization to the current recolonizations. Concepts as space, percentage, design, counting, and locating was brought as a digest to promote the expansion of the *sea-ing* motion perspective lived in each of the five cases. They are shared in their temporal line with the intention to respect the waves sequences and not to maintain any linear structure.

Having the five concepts presented themselves as a preponderant factor in the counter-colonization process (Santos, 2015) of mathematical knowledge in each community and also for aligning with the idea that their knowledge is a privileged dimension for understanding the different forms of live and feel life among the different ethnocultural groups, revealed here, we sought to understand the differences and the interlocution between the plurality of the cosmovision of knowledge of such concepts.

## CHILDREN IN STREET SITUATION AND THE CONCEPT OF SPACE

An ethnography on the culture of children in street situation and the concept of space was developed in the city of São Paulo at the beginning of this century (Figure 1), in which a new worldview was evidenced – the cosmovision (Santos, 2015) present into this culture. With fourteen street children and young people, from 4 to 17 years old and for a year and four months, a diversity of methods was co-created, and new knowledge born through their implementation. The concept of space was revealed itself in a slow (Bourdieu, 1980; Harvey, 1989) and participatory (Borda, 2022; Lewin, 1946) movement, in which the belonging and the sense of place were the core of the systematization process. The “street age” of children and young people was in the period between six months to eleven years. These fourteen children are identified as part of two street groups: *Capa* group, with six children and youth, was led by a street mother; *Rua* group, with eight children and youth, was led by a street father.

### Figure 1

*Zoinho (Image taken by Evandro Monteiro in 2004, in downtown São Paulo, Brazil)*



As an academic project, this bottom-up movement was born out of two ways: a meeting of five people who worked on the street with children in street situation and a meeting between a doctoral student and two professors. The first way brought a strong knowledge of this culture and the confidence of the children and young people in their sister, in the two psychologists, in the social worker and in the volunteer – who joined the academy for other purposes. The second way was developed in informal dialogues between the two professors and the volunteer, at the time a master’s student. An awakening, born of the second way, revealed the potential of the concept of space, co-constructed by children and young people who needed to learn to survive on the street, as a libertarian tool (Betto, 2006; Boff, 2022; Freire, 1970; Libanio, 1979) to achieve an – (Balibar, 2011) inside the society and, at the same time, an educational tool to learn other ways to live, amplifying the western linear worldview (Santos, 2015).

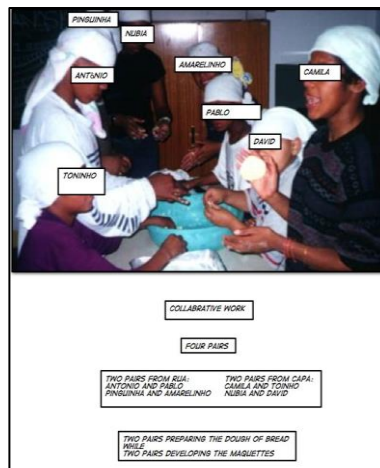
From a cautelous and slow critical ethnographic praxis aligned with the total respect and active listen inserted on the contact with this ethnocultural group, as well as with some of its specific knowledge, which the science determines as mathematics, an ethnomathematics posture was developed by all members involved on it. The cultural encounters need to be felt through mutually co-constructed

affections from belonging to a cause – the cause of the equitable intellectual encounter, an equal liberty (Balibar, 2011) to feel, to know, to practice in the process of collective construction of a new mathematics knowledge inexorably aligned with the dignity of all lives involved in the encounter.

During this period, São Paulo experienced a new political moment and all laws linked with the street condition of human being, children rights, and right to the city needed to be revised, which was done with children and young involved in the project (Mesquita *et al.*, 2011), fully based on the rights and duties as citizens of this place. This bottom-up movement, with slow and participatory methods – as culture circle (Freire, 1970) and critical cartography (Harley, 1989), inside what that time called new ethnography and today is understood as critical ethnography (Thomas, 1993), redefined the social, cultural, and ecological spaces of all members involved on that. Other needs detected by the children in street situation was worked in a same way where all members of this bottom-up movement, respecting each individuality, became researchers of their own practices (Figure 2).

**Figure 2**

*Making mapping and bread*



## INDIGENOUS TEACHING TRAINING AND THE CONCEPT OF PERCENTAGE

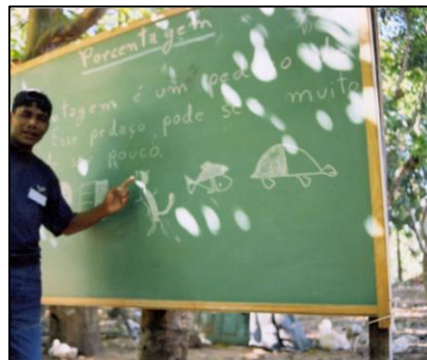
A bottom-up movement of mathematical educators who, based on ideals and experiences, decide to walk together on Freirean bases<sup>1</sup> in the search for the consolidation of Ethnomathematics (D'Ambrosio, 2002) in formal, non-formal, and informal educational practices, constitute itself a group of study and research at the Faculty of Education at the University of São Paulo, in Brazil, in the late 90s by the initiative of the researcher Maria do Carmo Domite. This collective stands out for its diversity, affection, active listening, and collective action. In a professional performance by one of its members, a critical ethnography began in the Xingu Indigenous Park – Brazil (Figure 3).

<sup>1</sup> The work of the Brazilian educator Paulo Freire.

**Figure 3***Xingu Indigenous Park's class*

The performance was in a training course for indigenous teachers from three ethnocultural groups: *Mebemgokrê*, *Panará*, and *Tapayuna*. Such training was requested by the indigenous people of the Xingu to understand the concept of percentage; they want to know what means 11% – percentage of indigenous lands at that historical moment. The mathematical knowledge becomes, here, a libertarian knowledge for the analysis, evaluation, decision-making, and action of the indigenous people in face of the violence that they have been suffering in the last 500 years, especially territorial, cultural, and intellectual.

The co-construction of mathematical knowledge, especially numerical and spatial relationships, developed differently. The cultural encounter between teachers non-indigenous, and members of the three ethnocultural groups relied on spoken language in a smaller amount than on body language and artistic expression, namely drawings (Figure 4). Almost all teachers speak only their own languages. The intellectual encounter, between technical-scientific numerical and spatial knowledge with traditional-local numerical and spatial knowledge, revealed the cosmivision of the indigenous in their governance and resilience to the detriment of the linear and hierarchical vision of the non-indigenous. This manifestation brought the need to (re)create the training previously proposed in name of promoting bases for a cultural and intellectual common ground founded in the premise that the quality of any school is us (Sá-Chaves, 2011). To integrate the percentage subject in this local educational process, non-indigenous people had to first learn the three different forms of numbering and spatiality present in each ethnoculturally group.

**Figure 4***Percentage explaining by drawing*

The ethnomathematics posture assumed by the teachers allowed to find research questions and paths of all members involved in the educational process, from the understanding-interpreting-dialogization knowledge shared in its subjectivity and particularity. One of the most constraints into the process of this collaborative, dialogical, and belonging training – part of the ethnomathematics posture, was the fact of some few indigenous establish relation with they have learned through the previous teaching mathematics at school. These few indigenous, who spoke a little Portuguese and have had a few contacts with the non-indigenous school, revealed a certain worry to make mistakes in their interaction, maintaining themselves more silenced during the first days until the teachers started to work specifically with them, inviting them to be monitors in the sub-groups of work in class with the excuse to speak a little Portuguese language.

## URBAN BOUNDARIES AND THE CONCEPT OF DESIGN

The Urban Boundaries movement – a collective of thinkers where heterogeneity was present in the background of knowledge, was born in 2009, during the development of a local project – D.A.R. à Costa Tr@nsFormArte, which was supported by the Portuguese Governmental Programm. Within the neoliberal policy established in Europe the *Programa Escolhas* – which in English means: Choices Program, where the choices were possible under a very oppressive cages, was experienced in its fringes. The ethnomathematics posture assumed by the thinkers, allowed to co-construct a new local sociocultural and ecological knowledge foci from participatory and critical encounters, which were developed to attend the main goals of the project, but they went beyond those – in the own topological ontology of the collective of thinkers. The sociocultural diversity is the main mark of this Program, which was created to attend the children and youth that are in the fringe of Portuguese society – members of local resilient communities in general (fishing, immigrants, refugees, gipsies, etc.). However, this Program became an intergenerational space where whole family of the target audience were active and constitutive of it.

This bottom-up movement was developed in Costa de Caparica, a city on the south bank of the Tagus River and a place considered within Greater Lisbon – a European capital of a member state of the European Union – Portugal. From that, and by collective decision, taken after the project was closed for addressing issues outside the objectives – such as the achievement of citizenship through the legal literacy process for some immigrant families of the target public, its members decided to continue independently. After a few attempts, as the precarious construction of a house – *Casa do Alegrim* (Figure 5) – to attend its collective demands – without successes in terms of physical built, but stronger in terms of intellectual and affective body, the collective decides to design of an academic project was developed as alternative to be together.



**Figure 5**

*Casa do Alegrim (House of Alegrim)*



By the three-handed existent in the collective: Scientific Researchers, Fishermen, and Residents of the Neighborhood – a non-legalized place with a large and ancient settlement where the diversity of resilient communities is present, the Urban Boundaries Project born (Figure 6).

**Figure 6**

*Bairro Community Mathematics Class*



The central point of the Urban Boundaries Project was to design in a collaborative way – co-design, participatory tools to eliminate the added value of people's lives and develop our critical emancipation as a collective. Rooted in Paulo Freire's Popular Education, the project promoted the systematization of the concept of community mathematics education, which began to be developed from previous ethnographic experiences lived by its members. Three tasks were parts of that: Multiple Cartography – a path to Cultural Cartography developed by Seemann (2013); Life Stories – focusing on narratives of Bruner (1985), and Critical Alphabetization – based on Ethnomathematics Program developed by D'Ambrosio (2002). The meeting of mathematical knowledge was transdisciplinary and transculturally worked, based on the sense of belonging with each social, cultural, and ecological spaces involved on the collective. Evidence of the humanization of mathematical educational spaces

of this bottom-up movement was present in the slowly transformed corporeality of the collective, which was developed from the implementation of the co-designed participatory tools. Co-designed collective actions revealed more compassion, more understanding of the needs of the other, as well as more empowerment of the three communities, promoted by more self-confidence and interrelations of each member of the collective. As Boof (2002) says: “A cabeça pensa a partir de onde os pés pisam. Para compreender, é essencial conhecer o lugar social de quem olha. (...) Isso faz da compreensão sempre uma interpretação” (pp. 9-10).

One relevant lesson from this critical ethnography immersion was to realise how is urgent to listen the desire and needs of each ethnocultural group and, from this encounter - with an active listening (Freire, 1993), to contribute – if they understand it as a way, with educational encounters – and not training in a unilateral position, in which the indigenous and non-indigenous teachers can exchange knowledge and co-construct their own way of teach in their cultural spaces the new knowledge (re)created, from these educational encounters, guiding them their local praxis respecting local curiosity and creativity, establishing co-construction with students, using an intercultural historical approach, valuing each creation of new knowledge from traditional knowledge and that new knowledge co-constructed in the educational encounters.

## LICEEI AND THE CONCEPT OF COUNTING

As a bottom-up movement, the research process of the concept of Counting (re)born from the experienced lived in the Xingu National Park and in the Urban Boundaries, both previously cited, as well as the result of an invitation to teach Ethnomathematics in the *Licenciatura Intercultural para Educadores Escolares Indígenas* (LICEEI) (Figure 7)- the first Brazilian contract as Ethnomathematics teacher. This graduation course was integrated by 3 cultural ethnic groups as students from the east of Brazil: Pataxó, Pataxó Hã-hã-hã, and Tupinambá, and non-indigenous teachers.

**Figure 7**

*LICEEI Ethnomathematics Class*



LICEEI was held in Cumuruxatiba, a coastal city in the state of Bahia, where history says that the place of the first Portuguese arrived, and was dedicated to the training of mathematics teachers. The proposed dynamic was based on promoting collective reflections on different ways of teaching mathematical concepts and, in this sense, co-constructing interesting, diversified, and meaningful strategies for each ethnocultural group present. It is worth noting that such groups, in the historical moment of this formation, experienced the ethnogeneses movement, making each member of each ethnocultural group visit their ancestry and (re)construct their own individual and, therefore, collective cultural history. All students spoke Portuguese and were, before this movement, inserted in urban culture for centuries, without losing fundamental parts in the organic maintenance of their cultural identities. Within this perspective, among other focuses, some pedagogical productions and contents for mathematics classes were presented.

The story of the number zero was brought with the intention of awakening the curiosity of the trainees. Accustomed to the dynamics of commonly taught school mathematics, one is rarely aware of the different representations associated with emptiness (which we know in Western mathematics as zero "0") existing in societies such as Babylonian, Mayan, Chinese, and Hindu, as well as of the possibility that there is no representation for this. However, when reviewing the history of zero in this formation, it was noticed that the act of counting is performed differently between different social groups (Bishop, 1999). It can be seen, not only in relation to the civilizations mentioned above, but also with all societies that make up the planet today.

By carrying out a sociocultural and ecological framing of the act of counting, the Ethnomathematics teacher exemplifies it by sharing the counting system of the peoples with whom she worked in the Xingu Indigenous Park. The Panará, for example, assume unity as a representation of a whole, so when asked how many indigenous people there are in the village, they answer "one", although the village could have a hundred individuals. However, for the Panará, the hundred individuals form a single group, a unit. The concept of unity of the Panará people is a product of the man-world relations co-constructed by its members - "is as transforming and creative beings that men, in their permanent relations with reality, produce not only material goods, sensible things, objects, but also social institutions, their ideas, their conceptions" (Freire, 1970, p. 128). At LICEEI, the mathematical acculturation suffered by the native peoples over the 500 years of finding stands out – represented here by the students, revealing that the way of counting instituted in these ethnocultural groups was school mathematics, what reveals itself the extreme importance of the ethnogeneses movement in which they were inserted.

After the framework, previously described, the abacus was introduced as a didactic-pedagogical multicultural tool and the proposal was to build a functional abacus with local material that would allow teaching mathematical operations such as addition and subtraction (Figure 8).

**Figure 8***Markup abacus*

According to Franco (2012) – educator at D.A.R. to Costa Tr@nsFormArte, and ethnographer at LICEEL, the students were divided into groups and looked, in their natural environment, for elements that would make it possible to build an abacus. The cultural diversity, creativity, and knowledge of these ethnocultural groups were revealed both in the materials chosen, as well as in the defined structure and in the respective operational method. They collected shells, cut canes, destroyed – or in their language, rebuilt, necklaces made from seeds with the intention of reusing their pieces and turned garments into teaching tools.

The co-construction of the mathematics knowledge developed in the conception of counting exercise, in LICEEL, evidenced the counter-colonization (Santos, 2015) emerging from bottom-up movements imbued with a praxis where the plurality is a strong tool to the emancipation, to the self-recognition, and the heterogeneous collective social participation through both cultural diversity as reconnection with Pachamama.

## PAITER AND THE CONCEPT OF LOCATING

From a post-doctorate experienced in the Urban Boundaries project by the Professor José Roberto Linhares, a new bottom-up movement was incorporated in Brazil at EmF – Education in Boundaries (<https://fronteirasurbanas.wixsite.com/emfronteiras>), which aroused from the need to create a space in Brazil where formal, non-formal, and informal mathematics education was expressive and worked from the bottom up. Ethnomathematics holds this premise at its core. However, the need to respond to mainstream research mode and, with it, to the behaviour of mainstream research - oppressed time, linearized and hierarchical space, and epistemologically caged mode (D'Ambrosio, 2014), became ethnomathematics a possible progressist food, as an example: when the desire to know and understand other mathematics serves to bring them to the formal processes, colonizing them.

One of the most relevant points of EmF was the achievement, within the formal academic structure within the scope of a master's degree, to get the defence of the same to be carried out in the indigenous village where the master's student was the schoolteacher. Here is talking about a deep

reflexion about the concept of locating, with which came the exercise of reallocating the core of the academic power, i.e., a very large geographical displacement, in addition to the relocation of the intellectual and administrative body necessary for the legitimacy of this procedure. The indigenous land was Paiter, which means "real people, ourselves". The Paiter people are also known as Suruí, name given by anthropologists, they speak a language from the Tupi trunk and from the Mondé linguistic family. According Surui (2018), the elders tell the youngest that these people migrated to the west land of Brazil in search of a safe place. However, when they arrived, they found themselves surrounded on all sides by other indigenous and non-indigenous ethnic groups. They arrived with their own knowledge and faced a variety of struggles and illnesses, they had no choice but to make peaceful contact with non-indigenous people on September 7th, 1969, at *nabekot abad akiwah* - the place where machetes are hung, in Paiter. A consequence of the Paiter contact with the non-indigenous was its population reduction from 5,000 to 250 indigenous people (Cardozo, 2011). Currently, the population of the September 7th Indigenous Land is around 1,500 Suruí, distributed in 25 villages, in a demarcated Indigenous Land with 247,870 ha, covering two Brazilian states. As of 1991, a school was set up in the Paiter village, and indigenous students began to attend the indigenous school.

The master dissertation defended by one Paiter – Gamalono Surui (Figure 9)-, in the Paiter land, and research the mathematics education in the Paiter ancestral knowledge. The Beat Markap, one example discussed by Surui (2018), is a Paiter traditional fishing technic, which carry both cultural roles out at the same time: a hunting and educational instrument. Before taking it to the river, it must be cut in a same size, depending on the size on the person who is responsible for this task, classified, and organized.

### Figure 9

*Gamalono's Master Defence*



The practice of Beat *Markap* has the following methods: each person who beats the *Markap* needs to have a partner, so that he throws water when he beats the *Markap* and alternates this practice between the pair. People who beat the *Markap* are called *ihtxag*, in the Paiter language (Figure 10). The women, at the end of the activity, classify the types of fish to facilitate distribution among their families and non-participants, when distributing everyone receives equally, but if by chance there are two or

three fish left over, the leader of the group keeps it. On the process of Beat *Markap* is evident that some mathematics operations are done. For examples, the division was carried out in the distribution of the fish and also distribution of the groups for the execution of the *Markap*; the multiplication in the junction of the fish before the distribution, and the addition in the junction of the fish at each time interval. The Paiter use the younger ones to carry out the process of hitting *Markap* and the older ones remain as guides, as this is how the Paiter maintain its knowledge from generation to generation.

**Figure 10**

*Markup being cut by one Paiter and Paiter people hitting markup (Surui, 2018)*



As in the hitting Makap, the communitarian mathematics education (Mesquita *et al.*, 2014) is present in the daily survival of the Paiter such as planting, traditional festivals, body painting, hunting, among others. All of these activities promote acts as distribution, selection, categorization, inferring, among others, using *somãpariht e* = division, *somãkakoh we* = multiplication, *somãoar* = addition (Surui, 2018). In this sense, this bottom-up movement promotes the meeting of two mathematical knowledge: the traditional and the scientific, in the line of adding recognition, validation and competence to both, exercising ethnomathematics, thought from the bottom up and felt within in the physical and intellectual postures.

## BACKWASH OF HUMAN MATHEMATICS RELATIONS: FOR WHOM?

The withdrawn displacement presents in the waves of critical ethnographies brings many reflections about the current mathematics education. However, the positional place of this motion, which cleans and groups, refers to thinking about for whom human mathematics relations are relevant. Mathematical knowledge goes beyond the scientific view, is here understood as fundamental human activities in which all cultures and societies have been shown. In 1999, Alan Bishop categorized some of

these activities as counting, locating, measuring, designing, playing, and explaining. However, since a long time he was being explicit assuming the colonizer place of school Mathematics.

*Of all the school subjects which were imposed on indigenous pupils in the colonial schools, arguably the one which could have been considered the least culturally-loaded was mathematics. Even today, that belief prevails. Whereas educational arguments have taken place over which language(s) should be taught, what history or religion, and whether, for example, 'French civilisation' is an appropriate school subject for pupils living thousands of kilometers from France, mathematics has somehow always been felt to be universal and, therefore, culture-free. It had in colonial times, and for most people it continues to have today, the status of a culturally neutral phenomenon in the otherwise turbulent waters of education and imperialism. (Bishop, 1990, p. 1)*

Bishop challenges the colonizer myth and emplaces the 'western mathematics' in its rightful place – as one of the most powerful weapons in the imposition of capitalist logic. This relational and positional posture intrinsic on the schooling mathematics knowledge culture has been discussed into the Critical Social Theory (D'Ambrosio, 2002; Restivo, 1983; Spengler, 1991), revealing how this mathematics cultural model was aligned with socioeconomic agendas, the sense of control, and the well-defined frontiers of human mathematics relations, all in name of progress – which is statistically constructed. Such progress has turned out to be regress, since the progressist development – as growth, has led to unsustainability of the planet Earth, for all life in it, especially for the own humans (Meadows *et al.*, 1972; Rockström *et al.*, 2009), product and producer of such development, and has reinforced the idea of the capitalist logic cannot but exploit nature as a whole.

Nowadays, still under the growth movement, the environment became a strategy to ensure the progressist success of the current sociocultural model world, adding Nature as an object of desire in a linear worldview and almost in a hard-boiled context. The human mathematics relations into capitalist logic are fundamental basements of these strategies. At the same time, resilient communities – which maintain a strong position in the face of their ancestral conscience, their traditional and local mathematics knowledge, and the sense of community as a communitarian place – in a counter capital order, have been remind a possibility for the humans to reconcile with Nature, in fact, with themselves. The human mathematical relations, imbricated in the natural contexts where the human is and is part, contribute to guarantee the very survival of the human being on Earth, if not the survival of the planet itself. However, the current thirst by the Nature is intrinsically connected with the hunger for unlimited, supersonic, and hierarchical knowledge – primordial bases of such strategies. As Tchékhev (2011) insists, in the tale of the Siren's Song, the true hunger of humans is the hunger for knowledge to feed their intelligibility.

Walking in a transcultural and transdisciplinary view, to discuss the topological ontology constitutive of the humanscapes, related with the equal liberty that has human mathematics relations as one of its roots, such hunger for knowledge is founded on the inferences human ability to produce culture thought its social contexts. Humans are considered social beings, social products and social producers (Durkheim, 1995) and all social facts unfolds from the perception of the “I” in the image of the “other” (Mauss, 2003), making the humans able to take on their role symbolically, establishing a symbolic dialogue intra e intercultural. (Mead, 1967). The culture is an adaptative system which is produced regardless of its geographical, historical, social, or biophysical place (Keesing, 1961), and is, with the unconscious, a structure of the social bond and a record of symbolic exchanges (Lacan, 1991). Face of the paradox of an immense cultural variety that contrasts with the unity of the human species and their own organicity, the culture is then considered beyond a complex of concrete behaviors, going to a set of control mechanisms, plans, recipes, rules, instructions to govern behavior (Geertz, 1978). The culture of mathematics knowledge is part of this set of mechanisms, contributing with the format of human topology.

Understand culture as a dynamic phenomenon is understand it as a natural phenomenon that has causes and regularities, allowing an objective study and analysis capable of providing the formulation of laws about the cultural process and the evolution. Laraya (2001) suggests that "culture developed simultaneously with the own biological equipment and is, for that very reason, understood as one of the characteristics of the species, alongside bipedalism and adequate brain volume" (p. 31). Indeed, the social and cultural acts are related with the mesological facts in Science a long time ago. Tylor (1883, pp. 1-2), in his work *Primitive Culture*, describes:

*Our modern investigators in the sciences of inorganic nature are foremost to recognize, both within and without their special fields of work, the unity of nature, the fixity of its laws, the definite sequence of cause and effect through which every fact depends on what has gone before it, and acts upon what is to come after it. They grasp firmly the Pythagorean doctrine of pervading order in the universal Kosmos. They affirm, with Aristotle, that nature is not full of incoherent episodes, like a bad tragedy. They agree with Leibnitz in what he calls “my axiom, that nature never acts by leaps (la nature agit jamais par saut),” as well as in his “great principle, commonly little employed, that nothing happens without its sufficient reason.” Nor, again, in studying the structure and habits of plants and animals, or in investigating the lower functions even of man, are these leading ideas unacknowledged. But when we com to talk of the higher processes of human feeling and action, of thought and language, knowledge and art, a change appears in the prevalent tone of opinion. The world at large is scarcely prepared to accept the general study of human life as a branch of natural science, and to carry out, in a large sense, the poet's injunction, to “Account for moral as for natural things”. To many educated minds there seems something presumptuous and repulsive in the view that the history of mankind is part and parcel of the history of nature, that*



*our thoughts, wills, and actions accord with laws as definite as those which govern the motion of waves, the combination of acids and bases, and the growth of plants and animals.*

In that sense, the human topology claims, in this period where the own concept of development is in crisis and is felt across all domains including the social, cultural, and environmental, for a search of a pluriversal paths "to renewal and re-politicization where 'the political' means a collaboration among dissenting voices over the kinds of alternative worlds we want to create" (Kothari *et al.*, 2019, p. 22). The post-development into human mathematics relations claim an engagement of an agenda for dialogical research where everyone can be researcher of own praxis. So, all mathematics knowledge (traditional, local, technical, and scientific), with their variety of worldview felt in the diversity of their praxis and in an equal liberty (Balibar, 2011) in their encounters, became a transformative tool to new collective strategies in the search for a sociocultural and ecologically just world.

## STORMS OF OPRESSION: HOW AND WHERE?

The anthropological position of the narratives presented comes from experiences of critical ethnographies, based on the transcultural and transdisciplinary approaches, in a diversity of resilient communities, extended from urban studies with children in street situation and slums to indigenous and coastal studies. The path taken provided a "smell" of the mathematics educational praxis of these communities and the possibility for a widen thinking about the humanscapes co-constructed into the human mathematics relations. However, a deep analysis over this paths brough awareness of the existence of structural concepts in the survival of these communities by socio-anthropological analysis of mathematics education processes (Restivo, 1983) arising from the complex interconnection of their own images and actions (Mills, 1959). The philosophical and historical contents surrounding mathematics knowledge, as well as its social construction processes, present in the works of Sal Restivo and Ubiratan D'Ambrosio gave theoretical-methodological consistency to such role. At the same and equal weight, the Popular Education, developed by Paulo Freire, supported this intrinsic research role in the critical ethnographic experiences.

The structural concepts were initially revealed and categorized in the early 21st, in two ethnographic moments: (a) when collaboratively observing, in a critical participative way, the sociocultural-ecological practices of children in street situation around the concept of space, and (b) when collectively analyzing the data of these observed moments. Collectively, here, means the research actions developed by all social actors that were involved in the critical ethnographies.

Cultural Identity, Self-Governance, Identification, Corporification, and Multicultural Racism were explored, reified, and suggested as a deep level in the complex-systemic bases of knowledge - to which science has identified as mathematics, in human design, allowing to think about the own human topology and its ontologies and cosmologies (Mesquita, 2008, 2016). All categorized concepts up are

highly complex, interconnected by invisible networks that exist in the sociocultural practices of children in street situation, insofar as they are informed and constituted, that is, they coexist, in their sociocultural practices, and are articulated with the sense of belonging to their natural environment, evidencing a close relation with the natural dynamic references alive in their survival.

Nevertheless, after the other critical ethnographies, here narrated, these structural concepts became as structural in the sociocultural-ecological relational and positional basis of these resilient communities in relation with their communitarian mathematics education. To know the existent meaning of these concepts in any resilient community is fundamental to understanding the development of local human intelligibility, over time, in the resilience imposed as a tool of survival in the present day.

Thus, understanding the development of local human intelligibility, which reveals the local mathematic communitarian knowledge, is determined by the necessity of maintaining the economic machine well-oiled and functional. The logic behind the mathematical concepts of an ethnocultural group evidences its social behavior, cultural structure and natural environment. To know the mathematical knowledge of a community is to know the fundamental pillars of its survival. However, to know the local knowledge is done as long as it suits the demands of the market – an historical alliance of science (who recognize and validate all knowledge around the world) with capitalism.

Žižek (2008) has been argued about the shattering impact of modernity, which is founded in the organicity of the capitalism combined with the hegemony of scientific discourse. For instance, in South Africa, a whole knowledge industry is developing around the idea of Indigenous Knowledge Systems (IKS), of which ethnomathematics is one component. Knowledge is recognized and valorized as long as it is aligned with the needs of capitalist economics, or as long as it does not present any really threat to it. In our current multicultural society, it is normal to recognize other knowledge, but such recognition only fortifies the myth of “participation”, while at the same time guarantees that no fundamental change either in scientific research or in society occurs.

This incorporation of ethnomathematical ideas into capitalist dynamics is possible through the implementation of an ideological injunction where we are willing to accept the Other deprived of its alterity (Žižek, 1992). That is, we are willing to accept the Other as long as it fits into our symbolic order as long as it is kept at a safe distance, the distance that prevents us from reaching its non-symbolic dimension. I love the Other (i.e., the poor, the indigenous, etc.) precisely because he is poor, oppressed and totally helpless, in need of welfare care.

Knowing the mathematics knowledge of the invisible Other is a tool to promote the sense of cultural identity, self-governance, and identification (Mesquita *et al.*, 2011) aligned with a progressist position in order to cage this knowledge. Nowadays, to know the mathematics knowledge of the Other has been revealed still as a growth tool, promoting the corporification by not taking responsibility for their actions, rendering their strategies useless and “accepting” them in a process of multicultural racism (Žižek, 2008), instead of recognizing local mathematical knowledge in itself, the growing pressure of the market

uses it as part of its machinery. This fact become transparent when thoughts about immigration period lived in the current times – the reallocation of bodies to specific spaces, or even when thoughts about in the COVID time – the reallocation of know-how to specific countries – a strategy to move away from the human mathematics relation that transforms the humanscapes and inhibits the intellectual equal liberty. As a result, the resilient communities are weakened, becoming docile, or even ghettoized in their cultural manifestations, increasing the number of invisible groups with a goal to their extermination.

## IN WAY OF THE PORT

A relevant lesson from the immersion in the five critical ethnography cases was realizing how urgent it is to listen to the desires and needs of each ethnocultural group and, from this encounter – with active listening (Freire, 1993), to propose – if they understand it as a way , with educational meetings – and not training ones in a unilateral posture, in which indigenous and non-indigenous teachers can exchange knowledge and co-construct their own way of teaching in their cultural spaces the new knowledge (re)created, from these educational meetings, guiding them in its local praxis, respecting local curiosity and creativity, establishing co-construction with the students, using an intercultural historical approach, valuing each creation of new knowledge from traditional knowledge and this new knowledge co-constructed in educational encounters.

However, all attention is claimed in the backwash motion towards the human mathematics relations with traditional and local mathematical knowledge. The resumption of this motion is closely related to the ghettoization of traditional and local knowledge when they intersect with other cultures economically superior. Such a “catch up” can add energy to the false, but still announced by the G-7, foreshadow of Western hegemonic thinking – dissolved with the rapid rise of China as the greatest economic power on Earth, and to the stigma of development as an ideology of a human topology without limits or boundaries – still felt in the ethnocultural groups from (or in reallocation movement in) any country. As examples: the compactness, connectedness, separability of such human topology will define the human mathematics relations and, from that, will shape the oppressed humanscapes.

Each ethnocultural group has its own ancestry, even the most distinct technical-scientific groups. All care must be taken with the encounter of the diversity of mathematical knowledge, which is, in this post-development world process, a possibility, or even, an arouse for the collective search for a sociocultural-ecological just relation. To rethink in a Planet that all and any live wants, and not just the human one, is a common ground also co-constructed in the encounter of the diversity of mathematical knowledge – traditional, local, technical, and scientific.

Taking pluriverse, cautious, and slow paths to decolonize the human hunger for knowledge is a contribution that mathematics educators can make – by being researchers of their own oppressive practices, systematically knowing the historicity of the human mathematical relationship, opening

themselves to new mathematical knowledge, and collaborating with the co-construction of the sociocultural-ecological relations of mathematics.

As argued by Franco (2022), in the net pulling exercise into artisanal fishing community, the importance of cooperation and being aware of who is in the other Band is noticed so that the net pulling is done in parallel. If one side pulls harder or faster than the other, the net breaks or lets the fish escape. The exercise of attention with intention (Ingold, 2022) contributes to constitute an equal liberty (Balibar, 2011) in the co-construction of mathematics knowledge in its plurality and, at the same time, to recontextualize the relation individual-society-nature – the humanscapes, by the acknowledgement of the connection of the individual with itself – CorpSpace, of the social relations in which the individual survive – OtherSpace, and of the individual's relation with the environment – EcoSpace (Mesquita *et al.*, 2011). The two boundaries' dimensions of the humanscapes invitee takes the individual even further, outside the comfort zone, achieving balance or lack of it in a transitional ecosystem, an extremely valued area from a *sea-ing* motion perspective. As discussed by Franco (2022), in a rereading Mesquita *et al.* (2011), "a first dimension at a personal level that invites each individual – CorpSpace, to an encounter with the OtherSpace, allowing the human being to reach different perspectives [...]. A second dimension takes us to an encounter with EcoEspaço" (p. 42), allowing the human being to reach the sense of belonging to the whole.

Moving towards a plural cosmivision of human mathematical relationships, *sea-ing* (Ingold, 2011) due to the needs to discuss the constitutive human topological ontology of the relationships between humanscapes and equal liberty (Balibar, 2011), the motion to degrowth expands based on the knowing the traditional and local mathematical knowledge – especially of the original communities constituted by ethnocultural groups, which have been guardians of Ancestry and Nature and have maintaining praxis (Freire, 1970) of counter-colonization (Santos, 2015) of the human mathematics relations. The degrowth motion (Demaria *et al.*, 2013) is a counter-order to break with the hegemonic and addicted mathematics scientific discourse, in view of the emergence of rethinking concepts such as counting, locating, measure, designing, playing, and explaining within the educational mathematics system, as well as the concept of sustainability (what does it means to be a sustainable thinker?), or even current conceptions about citizenship, democracy, and territory – all of them intrinsic of any schooling mathematics practices. The future is ancestral (Krenak, 2022) and the development as a promise - the big game of the modernity, is over!

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