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Mathematical *Forms* in the Look about the Human Body: Thought, Technique, Art and Education[1]

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ABSTRACT

This article is an analytical exercise on a way of thinking in which mathematics operates in the ways of representing and speaking about human body drawing. With a problematic attitude, one asks: how and where does a technique that colonize ways of representing and looking at the body in art and math activities in the classroom come from? This means analysing a modulation of look and thinking that organizes the imagetic representation of the human body, shapes the image, and orders thought, in which mathematics operates as the agent and effect of a mode of colonization. Therefore, it takes different ways of representing the body in art history, operating in a theoretical-methodological movement, with "the perspective of visuality for visualization in Mathematical Education". Thus, other possibilities of (re) thinking with images are raised, analysing them under the bias of a *decolonial mathematical thought*, that is, a thought that questions and denounces the effects of truth and the hegemonic mathematical visualities. From this, then reinventing itself to re-exist in Mathematical Education.

Keywords: Mathematics Education; Mathematics and Art; Mathematical thinking; Drawing of the body; Decoloniality.

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RESUMO

Este artigo é um exercício analítico acerca de um modo de pensar em que a matemática opera nas formas de representar e falar sobre o desenho do corpo humano. Com uma atitude problematizadora, indaga-se: como e de onde provém uma técnica que coloniza modos de representar

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e olhar para o corpo em atividades de arte e matemática na sala de aula? Isto significa analisar uma modulação do olhar e do pensar que organiza a representação imagética do corpo humano, dá forma à imagem e ordena o pensamento, em que a matemática opera como agente e efeito de um modo de colonização. Para tanto, toma-se diferentes modos de representar o corpo na história da arte, operando num movimento teórico-metodológico, com "a perspectiva da visualidade para a visualização em Educação Matemática". Com isso, levantam-se possibilidades outras de (re) pensar com imagens, analisando-as sob o viés de um *pensamento matemático decolonial*, ou seja, um pensamento que questiona e denuncia os efeitos de verdade e as visualidades matemáticas hegemônicas. Disto, então reinventar-se para re-existir na Educação Matemática.

Palavras-chave: Educação Matemática; Matemática e Arte; Pensamento matemático; Desenho do corpo; Decolonialidade.

NOTES TO START

Which place do we occupy when we say what we are proposing to say here? This could be the first question about the intention of this text. Answering this question is to ex-pose a research that discusses something that dialogues and articulates with the Group of Contemporary Studies and Mathematics Education (GECEM / UFSC). We cannot talk about that something without initially saying that

> GECEM is a group that studies, thinks, exercises teaching, learning, research with mathematics, the mathematics education. A group that studies many other things that are entangled in all this: vision, visualization, visuality, image, art, device, childhood, history, mathematics, school, and so on. All of this, so to speak, in a contemporary way (Flores, Machado & Wagner, 2018, p. 130).

The group's studies articulate culture and history to investigate issues inherent to Mathematics Education and involve visual practices linked to Mathematics Education. In other words, the group focuses on investigations related to the history and intertwining of mathematics and art, asking and discussing what this can resonate in Mathematics Education, in historically constituted educational practices, in learning in mathematics, in teacher's profession, in being and experiencing to be a researcher.

Based on this, we present a problem that emerged from a doctoral research. From this, we seek to problematize a *mathematical thought* that intermingles in the relationships that the mathematics-art connection can make possible and enhance for the Mathematics teaching. Hence, the objective of this article is to do an analytical exercise about a way of thinking in which mathematics operates as an agent and effect in the ways of representing and speaking about the representation of the human body, as, from the results of some of the research works, a hegemonic, colonized way of perceiving and representing the body from the pictorial art is perceived.

Initially, we skim through some theoretical-methodological modes operated by the works of GECEM, in which this research is inserted. First, we expose the visualization-

visuality displacement in the survey of the issue surrounding the look and the representation (Flores, 2013). Then, moving this displacement in a problematizing attitude, we start our path as we exercise the thought as we look at techniques, images and arts in relation to the representation of the human body, raising traces of how technique and art in the portrait of the human body colonize ways of representing and looking at the body, in which mathematics operates as an agent and effect of a mode of representation. Finally, we open a space to launch other possibilities when (re) thinking with images, questioning them under the bias of a *decolonial mathematical thought*, that is, a thought that questions and denounces the effects of truth and the hegemonic mathematical visualities: re-inventing itself to re-exist in Mathematics Education.

STARTING THE PATH WITH VISUALITY AND DECOLONIALITY

From the book "Olhar, Saber, Representar: sobre a representação em perspectiva" (Looking, knowing, representing: on the representation in perspective) (Flores, C., 2007), which is anchored in the theoretical framework thought by Michel Foucault, there is a movement to perceive that our way of looking and representing is manufactured, instructed, invented, built amidst power relations, social issues and cultural movements, that is, it is culturally and historically situated. Therefore, the way in which we relate today with the knowledges, with the forms of representation and with the way of looking at them, is loaded with historicity. This lead us to say that our modern look in mathematics is cultural, interacting with modes of representation, and to question how a "mode of representation in perspective, for example, was established, based on a specific regime of knowledge, of looking and of representing, constituting the hegemonic form of image representation, as well as an instrument for formatting the look" (Flores, C., 2007, p. 23). This idea of looking at the image as an open window to the world, since the Renaissance, in perspective and without strangeness, idealizing harmony, symmetry and the organization of things, is a colonized way, dictated by Western culture, based on the Cartesian, geometric, perspective idea of the world. In all this, "the act of seeing is inherently framing, interpretation, loaded with affections, cognitive and intellectual" (Flores, 2015, p. 255). When we look at something, we look from a certain place, through some lens, the act of seeing is already framed and loaded with codes that permeate the culture in which we are immersed in our historicity: "our look has no way out, it is colonized to reconstruct a rational, perspective world" (Flores, C., 2007, p. 171).

From the reverberations of this first provocation around the construction of the mathematical look in perspective, a way of theorizing and a methodology emerges with the author, Cláudia Flores, which she calls a "perspective of visuality for visualization in Mathematics Education" (Flores, 2013). From this, a theoretical-conceptual displacement from visualization to visuality is made. This is a necessary movement for the studies of GECEM, because it is from the visuality that we feel the strangeness and problematize a naturalized way of looking at things, the practices and techniques of looking historically and culturally constituted.

Realize it: "One day we were told that the whole world is given in perspective. [...] it is enough that you position yourself very well, in a safe and certain place, and you will be able to look at the harmony, symmetry and beauty of the world and the things it embraces" (Flores, Machado & Wagner, 2018, p. 130-131), so that no strangeness is found in all this, it would be just a mental, cognitive operation, the eye as an organ born to look in a certain way, it is the mind's eye. What is evident in this process of looking at and thinking about things in the world through visualization "is the Cartesian, put in perspective, geometric eye. And the better the mind's eye sees it that way, the better it will learn or know mathematics" (Flores, Machado & Wagner, 2018, p. 131), for example. In the visualization movement "we never, or almost never, ask ourselves where our truths come from" (Flores, C., 2007, p. 30), what is shown is the need to train the look to know how to see things in a certain way, achieving a better, more critical view, through mental, cognitive images, through representations, processes and visualization skills. In general, the topic of visualization and Mathematics Education was understood in the light of the assumptions of the psychology of learning and semiotics (Flores, 2016).

With visuality, we understand that the way we look, whether in perspective (a look without strangeness) or not, would be nothing more than an effect of truth, a way among so many others to think and look at the world, since the visuality is understood as the conjunction of discourses that are formed and inform how we see; and this allows us to question the naturalized forms of looking and representing, questioning the visual regimes that are historically and culturally instituted (Flores, 2013). In short, the perspective of visuality for visualization in Mathematics Education provides "a basis for the analysis of visual practices, exploring the role of mathematical concepts in visual regimes" (Flores, 2013, p 93-94), problematizing how mathematics is, at the same time, agent and effect of certain visual practices. Going a little further, how mathematics operates as an organizing element, through art, affecting our ways of looking at things in the world and from the world, affecting our thought.

In a movement to operate with this theory and methodology, João Moraes (2014) problematized how paintings of the human body enhance mathematical thinking exercises, in a space of four workshops with children from the 5th grade of elementary school and with paintings by the artist Wassily Kandinsky. In his exercise, in the mathematics classroom, it was possible to perceive some evidence of mathematical knowledges that appeared between productions and imprisonments in the hegemonic way of representing and speaking about the body, since the children prioritized attributes that claim a proportional, measured, balanced body in its homogeneity. Among the knowledges that were evidenced in the author's *process of experience* are: the geometrization of the space, the Aristotelian space, the mathematization of the movements, the proportion, the volume, the beauty measurements of a body that is only a body when it has volume, that is only beautiful when it is symmetrical, that has functionality only when it is proportional. They are visualities interposing themselves in the children's way of looking at images around the human body, traces of ways of speaking and thinking mathematically, shown in the field of discourses that inform how we see. In particular, the author's movement opens up a fissure through which we can analyze and problematize a thought about the body that

is always consolidating, in recurrence, ways of looking at it, in a certain way and not in others, that is, it is something that comes forming and formatting our subjectivity in relation to hegemonic visualities.

Not intending to search only for geometries of Mathematics in Art, or even to place mathematical knowledge as an empirical or transcendent object that composes or represents an image in art (Flores, Machado & Wagner, 2018), Kerscher (2018), inserted in these discussions, proposed a transition through the possibilities of the very mathematical thinking, in the transformation of what is seen and heard, *thinking about what is seen and not seeing what is thought*, an opening to think again and again. The author problematized a mathematical thought that intermingles in seeing and knowing in the teaching of Mathematics through workshops with children and geometric abstract art. With the visualities exercised in the research, it was understood that despite the children establishing their paths and (re) drawing a map of their trajectories when expressing themselves with mathematics, "a mathematical way of thinking was already established, naturalized, and that *children are the all the time drawn to a certain reality*, to a certain rational way of looking and talking about the world" (Kerscher, 2018, p. 128, emphasis added). The research mobilized problematizations and discourses that speak about the (dis) organizations of space and time, of the (dis) structures and (dis) harmonies between shapes and colors in the representations of the world, of life itself. In one of Kerscher's workshops, the disproportion of the body caused estrangement in the child's gaze: the body could not be at the same height as the house, that had also been drawn on the same plane. But, once again, to comfort the look, the game addressed the perspective: the house was farther away than the person, just by looking correctly, everything would be proportionally right. A desire for order and certainty, proportion and perfection, standing out the effects of truths in the hegemonic discourses on how to look correctly at the representation of the body (Kerscher & Flores, 2019).

Well, one walks among visualities. One runs through problematizations, estrangements, scintillations, visibilities and invisibilities of thought. A journey that, thinking with the education philosopher Jan Masschelein (2008),

> allows a look beyond all perspective, since the perspective is attached to a point of view in the sense of subjective position, that is, exactly the subject's position in relation to an object/objective. Walking means putting that position in play, it means ex-position, being out of position (Masschelein, 2008, p. 37).

It means, therefore, to be vulnerable to the instabilities of the path, feeling the destabilizations of certainties, of the instituted truths. It means to be open. To open our eyes to other ways of seeing, unbalancing the inertia that makes us stand still or that only moves us through the straight and uniform flow.

That said, considering the problematization of mathematical forms in looking at the human body implies feel the estrangement of the mathematical formats and techniques in

the look and in the thinking about the representation of the human body. More than that, and in the case we discuss here, it means to feel an estrangement at how activities with images of art in the mathematics classroom prompt the sameness of the visual: proportional, geometrized, harmonic forms, in the service of a well-balanced representation. This, therefore, operates with representation techniques that colonize the look to see in a certain way and not in another, among which the technique of representing an ideal body, to be copied, admired, idealized, recreated by a Cartesian, rational, sovereign, homogeneous, closed, permanent subject in its objectivity. A representation that allows the subject to see a world outside him/her, in such a way that one can confuse the object (body) represented with the real object (body). In all of this, we emphasize a mathematics that operates as an agent and effect of a colonization mode, of dictating norms to portray the traces of the human body, repeated in the teaching and learning of mathematics.

Now, in the scope of decolonial studies, especially in the scope of aesthetics (Gómez & Mignolo, 2012; Ballestrin, 2013; Achinte, 2013), it operates in three movements. First, identification and reporting of hegemonic visualities raised from the activities developed in the classroom, bringing up other possibilities, perhaps marginalized visualities. Third, to operate with what is called aesthetic disobedience, with which something new is produced, that is, one thinks of possibilities for re-existence, or re-invention, in being and knowledge.

From this understanding, or rather, from this place of study, and from the hypothesis that a type of mathematical thought captured and colonized our way of looking, what is being done here, for now, is a movement to identify and report hegemonic visualities in relation to certain types of representation of the human body. Then, in an exercise of looking, we give visibility to modes of representing the body that are often marginalized, placed on the margins, left on other planes or poorly lit. And, finally, as an indication of our later study, we point to the potential of producing something, thinking about possibilities of re-existence, or re-invention, in being and knowing in Mathematics Education, since, when we leave of mathematics, we find that outside there is still much more mathematics. Let us see how such understandings imply the exercise we are proposing.

GOING THROUGH THE PATH: EX-POSITION OF SOME WAYS OF LOOKING AT THE HUMAN BODY

There are pulsating thoughts here that spark some questions regarding the body drawing. One day we were told that body measurements are given by ideal anthropometry, like this: by rules of proportion, relating the dimensions of body parts to each other and to the total height.

> The knowledge of man becomes the result of a calculation of scientific anthropometry that will make effective the classification of types, identified and classified by psychological, somatic and morphological traits. Artistic anatomy returns the canons of beauty of the museums and educates artists in classical

> parameters to represent the morphology of the order of body shapes and proportions (Flores, M., 2007, p. 51).

Some say that the Vitruvian Man, idealized and disseminated in the *Ten Books on Architecture* by Vitruvius (1st century BC), and represented notably by Francesco di Giorgio (1439-1501), Giacomo Andrea (? - 1500) and Leonardo da Vinci (1452 -1519), each one with their specificities, portrays an ideal of beauty: the classical ideal of balance, harmony, symmetry and perfection of the proportions of the human body. From this, not only a scientific and rational thought follows, but also resonances of a body represented by Greco-Roman art. See, there are traces of the "classical canon", the maximum manifestation of perfection, beauty and balance in the expression of the representation of a proportionately beautiful human body, referring to the gods, to the modeled and healthy bodies, a body to be produced, including: the one with the top of seven heads, that is, "the canonical measure of Greco-Roman art, referring to the golden equation, used in the frieze of the Parthenon, created by Phidias, in the 5th century BC" (Flores, M., 2007, p. 103). We remember here that Aristotle also stated that "the superior forms of beauty are order, symmetry and precise delineation" (Jenkins, 2015, p. 72, our translation), this would be a classical ideal of unity and integrity of beauty.

From other biases and glimpsing this idea of the portrait of the Western body, there is, in the Christian tradition, the conception of a harmonious and beautiful body that is given to the image of God, "the human being is the most beautiful of creatures and, in particular, the body of Christ, man-God, embodies the idea of perfect beauty" (Arasse, 2012, p. 543), but, at the same time, this is a body that is a source of sin and, therefore, forbidden, in silence, prone to be judged.

On the other hand, in modern art there is a search for a representation of forms that present the constant changes and accelerated transformations of the beginning of the 20th century. They are new modes of representation, the body starts to be represented in a fragmented way, which calls into question the identity of things, of the subject him/herself (Michaud, 2011). At that moment, what was presented was

> [...] great technical inventiveness, experimentation and the use of all possible instruments of visualization of the body and the human things. [...] These visualization techniques, as they become more powerful and painless, paradoxically also become more invasive and aggressive. They put the body in the proper and figurative sense, even in their interior. They chase it down to the most intimate part. They use schemes, they unveil, exhibiting what was invisible, hidden or secret. The real things are left without veils or the possibility of shelter, abandoned to the drive to see. These images of the body, which at first are believed to be only "new", actually transform the relationship to the body (Michaud, 2011, p. 546).

In contemporary art, the representation of the body is no longer prophetic or visionary, but a body that is both subject and object of the artistic act (the artist as a body and the art as an action); it is no longer potential of representation, but potential of production, of presentation, that is, it presents itself as a mechanism of social reflection, of thinking of a society as a system, thinking about what society apprehends, as well as what happens in its core, the ephemerality of events (Michaud, 2011).

The intention here is not to mitigate the dimension of the history of the representation of the body. Notice how it has shown us that different views of the world produce different ways of representing and acting with and on the body. There are bodies that are inscribed and dictated from ideals consumed and constituted by societies, because "like any other reality in the world, the body is socially constructed" (Barbosa, Matos & Costa, 2011, p. 32). From the senses built for the body, it is essential to retain, as Tucherman (1999) reminds us, the Pythagorean influence in what is called the *Western way of being*, that is, something that produced a difference with the non-Western things, and affirmed a logic of thought for our cultural experience, that is, it was related to the use of images of geometry to represent or symbolize nature, founding a conception of the world, leading us to think of the Cosmos, for example, as a dome, in a spherical way. Therefore, the reading of nature from geometry is either the picture or the imaginary, where the mention of the body is always the statement of the desire for form (Tucherman, 1999). Resuming to the Platonic aesthetics, we feel the resonances of Pythagorean thought: model and copy should coincide, art should be the servant of truth, copy physical objects, reproducing them faithfully, art should imitate the ideal beauty of absolute forms, inapprehensible, captured only by the intellect of the one who comes closest to the essences or ideas, a search for the model to guarantee the ideal beauty (Flores, M., 2007), that is, the form as the premise of the beauty. Geometric shapes, measurement techniques portraying the body's traces, always precisely, through art and from thought and mathematical language for representation.

And we could still look at the representation of the body in activities developed in the classroom, as mentioned in Moraes's (2014) and Kerscher's (2018) research works. By articulating Mathematics and Art, their research present visualities in relation to the body that strengthen those linked to the representation of the ideal body, perfect in its proportions, repeating the hegemonic, because we learnt to look like this, preventing mathematics from being operated in other ways. Therefore, mathematics emerges in this space as an effect and agent of these modes of representation.

All this to say that, among so many places that we could occupy to look at the representation of the body, we occupy the place of a thought and mathematical knowledge as an agent and effect of ways of representing it in art: how images colonize ways of representing and looking, indicating that we are subjectified by a mathematical thought? Is there a modulation of the look and the thought in certain images and representations? In other words, a modulation that organizes the imagetic space, that shapes representation, that orders the thought? What happens when Mathematics governs the way of representing, being and speaking in/of the world? Can we say that Mathematics functions as a scheme of

thought through which we learn to look at the things of the world? Questions that remain unanswered here. Just a few reflections that emerge when walking with representations of the human body and with art.

IN THE WAY, A MEETING OF THOUGHTS AMONG IMAGES

We venture to say that there is a Mathematics that wants to be hegemonic and only allows some things to be shown. There is a mathematical thought that intervenes in the ways of speaking and being in the world to the point of colonizing being and knowledge (Ballestrin, 2013), in the ways of producing image and knowledge.

> There are ways to look at, to know, to represent things in a society that are so imperative that we think that everything happens in the most natural, neutral way. So, not to question them is to allow authoritarian influence, it is to give up the understanding of the historicity of our way of looking, of representing, of knowing and, ignorantly, letting ourselves be manipulated (Flores, C., 2007, p. 176).

So, what we see are the realities, the truths. Moving truths that create realities. Elastic realities that interconnect among truths. "It is just the following: which of the realities becomes intrinsically convergent with the truth? Which of the truths is preparing to converge intrinsically with the real thing?" (Benjamin, 2012, p. 157). To problematize: this is the point at which we find ourselves. From the concerns that pulsate us, we problematize, as previously mentioned, a colonized way of representing, looking and thinking with images, with art, with techniques. Or written in another way, a mathematical thought that colonizes the ways of looking and producing images. Because "the way we look [...] would be nothing more than an effect of truth, a way of thinking and looking at the world" (Flores, Machado & Wagner, 2018, p. 131).

That said, and thinking from and with assemblage of images (Figure 1 and Figure 2), the question is: what do the images show? What do they make us think? What do they refuse to reveal? It is known that images carry a thought, on the one hand, from the one who produced the image, on the other, from the one who looks at it. For, "because it is an integral part of a system in which thought circulates, it participates in a thought" (Samain, 2012, p. 31). Thus, we put images of certain types of representation of the human body into tension and find a link: a mathematical thought that colonizes the ways of looking at and representing them. What fissures do those images cause? We rewrote this question and think with Samain (2012): how do these images, in a visual relationship, invite us to think? What do these images allow us to think? Perhaps we can say that the image is "sometimes a piece of *real* to nibble, sometimes a spark of *imaginary* to dream" (Samain, 2012, p. 22, emphasis added), often bordering on what is not possible to say. For, yes, the image is much more than an object, it (the image) is the place of a living process, it participates, therefore, in a system of thought (Samain, 2012).

Moreover, it is this system that we put into play in this opening of a world of things when looking at the representation of the body through the assemblage of images. Since looking is also an act of choice, we chose some images to exercise those ways of looking at them, by which something can be indicated in the thinking and writing of this article.

EXERCIZING THE LOOK: HEGEMONIC VISUALITIES

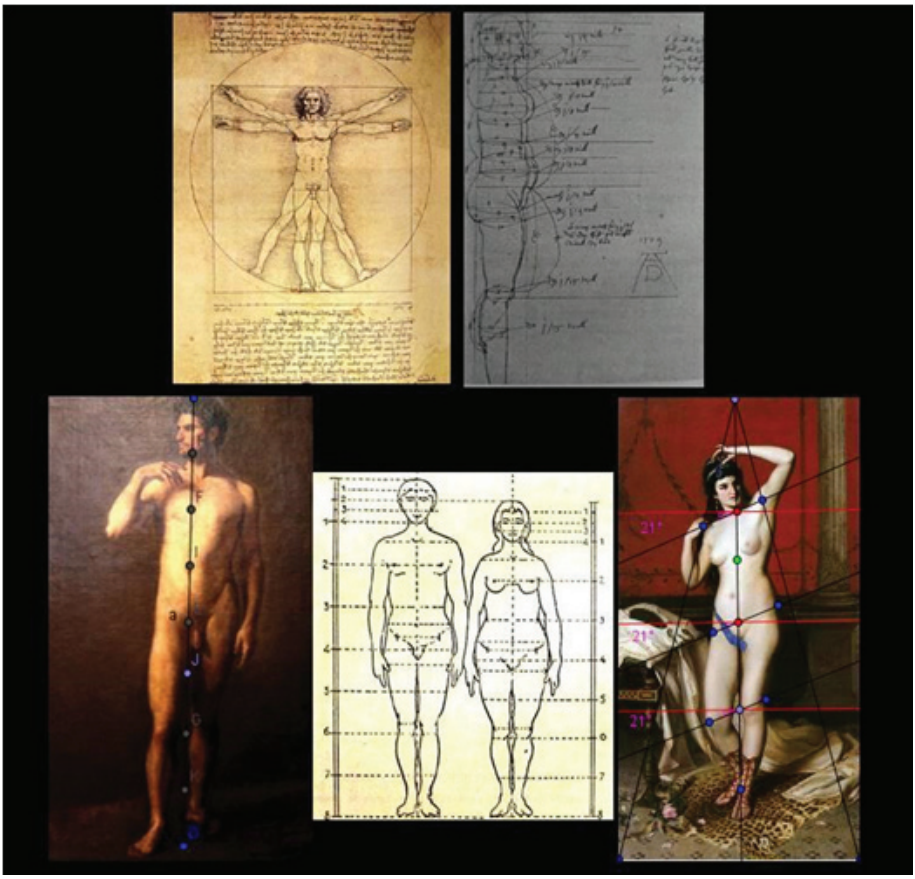

Figure 1. Assemblage: hegemonic visualities. In detail: (a) O Homem Vitruviano, 1492, Leonardo da Vinci version; (b) Mulher de oito cabeças, Albretch Dürer; (c) Academia Masculina, 1870-1880, João Zeferino da Costa, intervention by Kerscher (2015); (d) Sketch of human proportions, made by João Zeferino da Costa in his textbook (1956, p. 64); (e) A Pompeiana, 1876, João Zeferino da Costa, intervention by Kerscher (2015).

Measured, proportioned, geometrical bodies, related to space by shapes, by harmony. A way of revealing the integrity of the body between the balance of space, movements, volumes and contours. By descriptions of techniques for the representation and of forms

for the content. As a goal, a link between the images: the search for ideal beauty, for the balanced movement.

To circumscribe and frame within two perfect geometric shapes the human body was an intent to demonstrate a body in its perfection.

> At the beginning of his book III, Vitruvius makes the human body measurements the source of the proportions that make a harmonious architecture and, in a passage destined to have an extraordinary impact on European culture as a whole, he 'demonstrates' how, in its perfection, this body is inscribed within two perfect geometric shapes, the circle and the square (Arasse, 2012, p. 542).

The artists sketched several figures to this ideal body, giving rise to multiple propositions. Among them, there is one that is found on the numerous pages of Leonardo da Vinci's manuscripts, which are filled with multiple drawings and reflections on proportions. Leonardo was inspired by Vitruvio's writings, however, he emphasized "the proportions among the parts of the body lacking functional or anatomical relations" (ARASSE, 2012, p. 547), unlike Vitruvius, who settled norms for the ideal proportions of the body as a whole. A portrait of the harmony of body measurements mediated by mathematical forms.

For Albretch Dürer (1471-1528) "art was both a divine gift and an intellectual achievement that required humanistic instruction and mathematics knowledge" (Ritto, 2012, p. 98), a mathematics that divided the body into parts, through anthropometric sketches in the theory of proportions to delimit not a single canon, but all possible types of representative figures of the human body (both man and woman). Mathematics was there as a promoter of rational principles. Dürer, in his desire to remedy artists who lacked scientific knowledge - because, for him, "without scientific knowledge, art was a random mixture of thoughtless imitation, irrational fantasy and blindly accepted practice" (Ritto, 2012, p. 98) -, studied and published treatises on the proportions of the human body, in which the human figure is studied as a whole, discussing in them symmetry and proportion, an intrinsic geometry of forms in texts and images, which served as debate material for many artists.

As in Dürer, the proportions of the divisions of the natural configurations of the human body are explained rationally - that is, somewhat geometrically - in João Zeferino da Costa (1840-1915). From Rio de Janeiro, Zeferino da Costa was an artist-teacher of historical painting, landscape and nude. He left as traces of his thoughts and learnings in Europe a handbook, in which he writes about his techniques of drawing the body, using a classical model to provide the drawing of the human figure, employing certain mathematical knowledge and teaching them for the representation of the human figure. In his studies, there is mathematical knowledge operated as an effect and support of a representation of the human body. There are records of numerical tables of the proportions, one of which is in relation to the proportion of the adult woman: 8 heads, which are

subdivided into 4 parts, as for the man (Costa, 1956). Other numerical tables and models of the artist's drawing tell of the ways in which the figure should be positioned for the ideal movements in different everyday attitudes: when the body is carrying something, leaning against something somewhere, pulling, pushing, climbing; and this understanding that the curvature of the image must be in harmony with the center of gravity of the figure. They are techniques built by the artist himself, in his style, and coming from other European artists, which modulate the look to see and draw the images in a certain way.

From the exercise carried out in Kerscher (2015), it becomes clear that there is a mathematical thought for these images governing the mode of organization, space, proportion, symmetry, the balanced movement of the work. The images are looked at from the ways of producing them, a way that gives visibility to a hegemonic mathematical thought that only allows showing some things in them: a certain idealization of reality, of a mathematically represented human body. These are some of the discourses, through mathematical concepts and knowledge, that Mathematics has been modeling, in the ways of speaking and idealizing things in the world. Therefore, the principles of the Euclidean geometry is used - the straight line, the parallelism, the transversal lines- to describe rules that conceive painting as a rational and ideal, proportional and organized representation, with balanced movement. However, we see this, in fact, since "the Greek canon [which] left us as a heritage a standard of beauty based on the principle of reason, of pleasant and harmonic proportions" (Borges, 2015, p. 71), going through the art history we are told, to the ways of being in and experiencing the world, because "the question of proportions seems to have preoccupied man from a very early age, as well as the representation of an ideal body, which we see in Egyptian art as in the top-models of today" (Calado, 2012, p. 110).

EXERCIZING THE LOOK: MARGINALIZED VISUALITIES

Figure 2. Assemblage: marginalized visualities. In detail: (a) Espaço para esquecer, 2014, Titus Kaphar; (b) Nu da gorda, 1944, Raphael Galvez; (c) Niño con un pájaro, 1965, Fernando Botero.

Up until now, when people spoke loudly, everyone listened and stopped talking to listen. From that point on, the voice fades, you can hardly hear it. Which kinds of mathematics are possible in this space of thinking with such images? Let us think with such images.

There is a hand that fades out. A bleached body. Bodies that are in the foreground, but afraid to be noticed: the traces that speak of the self are erased. The body that is not seen, because it is hidden, silenced, faded, bleached, blurred or erased. A space that gives us something to see but aimed to be forgotten. The black body is hidden, inferior, curved, diminished. The body devoid of hegemonic standards is erased, and often, when drawn and shown, it is somewhat exaggerated in its forms, unreal, excessive in its presentation. One of them offers voluminous forms in the choice of the style of representation, as if shouting in its exaggeration: Look, I am also here to be seen! And, in all that, bodies that cannot be seen, bodies that will not be shown, bodies that will be blinded, bodies that will be segregated, bodies that will be excluded, bodies that will be denied and bodies that do not want to be seen, persuaded by the criticism of representation.

- What are you hiding there? What is hidden? Which traces appear? What math? And in the classroom, what space do they have?

In the emphasis of the rounded volumes, marked by the shapes, by the measures, we forget what is taken in hands or what is marked on each one's body, which is a unique mark, the experience.

When selecting and configuring elements of the painting, Raphael Galvez stifles the traces of identification of the portrayed in the *Nu da gorda*, since it is an academic painting. Or rather, "Raphael Galvez [...] does not reproduce [the elements] as an academic artist would: he selects and configures elements according to interpretive optics, often seeking an elementary synthesis" (Nascimento, 2012, p. 34). The artist paints small rays of light in the place of what was obliterated, a *nude beyond the academies*.

And at school, in the math classroom? In the emphasis on concepts and content that are always well structured, dictated for a cycle, you leave the happenings in other planes, in the emergence of the present, with children, at school, when the possibilities of mathematical thinking are brought to the table. You forget to be with them to do [something] for them. You forget that children elaborate thoughts, their own thoughts. You forget that the children see and create a world of things in their fantasy. You forget the magic awakened by a bird when it rests on a body that walks around the world: you forget to open the cages and release them; you forget that children and birds are free from shapes and formatting; you forget that children and birds move, above all, around the world; you forget that the children are full of fantasy and venture into the world of invention and discovery; you forget that... or you are made to forget...

Still, in an erasure of the hands, their ways of being and knowing are erased. Otherwise, erasure opens a space to think about the non-place that other types of mathematics occupy in the classroom, for example. Other ways of thinking are erased... Other ways of displacing yourself around the world and inventing paths are erased...

Other ways to marking the world with hands and body are erased... The hand fades out. The body fades out. The mind, the thought itself and the thought of the self fade out. It is necessary to light the figure, the smallest thing, the margins, the types of *mathematics beyond Mathematics*. It is necessary to bring the very mathematics and what it does to be what it is, and what it is to do what it does with our subjectivities.

FIRST STOP IN THE MIDDLE OF THE PATH: WHAT CAN A DECOLONIAL MATHEMATICAL THOUGHT DO? CAN IT DO ANYTHING? YES, IT CAN!

To tie up loose ends without, however, concluding, we expose the latest concerns that have haunted us until now. What can a decolonial mathematical though do? *Can it do anything?* Can it do anything in Mathematics Education and visuality? Can mathematical thought do anything?

Yet, what is it to be a body? What is it to have a body? What is our corporeity today? A body that was invented, but also and in a way imposed, proposing a totalized, singularized and recognizable "desire to have a shape" in all its aspects (Tucherman, 1999). What possibilities are open to us today and what experiences are possible?

There are techniques, arts and thoughts about the representation of the bodies that are constructed and constituted in such a historically enlightened way, that we forget that others co-exist. The different drawings on the human body work as a suggestive diagram, a working hypothesis to enhance thinking about techniques, forms, ways, the very thoughts and arts in the ways in which mathematics is organized and the way of looking and thinking.

In this movement of thinking, for the time being, with the assemblage of images, questions are raised about the naturalization and neutrality of a mathematical thought that imprisons and colonizes the look, the representation, however, and moreover, that colonizes what can be the object of teaching, determining what certain concepts in mathematics are for, which, in short, has been perpetuated with the coloniality of the knowledge and the being. It can be said that all of this leads to an aesthetic and epistemic domination that is organized on the hegemonic basis of the conception of the modes of representation and meaning of the human body.

In addition, when you try to look and think with marginalized visualities, the thought itself fades, gets lost among possible mathematics that can be illuminated with the images.

Now the question is: can a decolonial mathematical thought do anything? Such power is in the order of possibilities and potentials. In all this,

> there is something to do, or rather, to think about. Because the end of a thought is not the end of the possibility of inventing; because we have no right to despise

> the present; because we need to know the dangers and the strategies that will allow us to resist; because we must choose what we want to remain and fight for it (Tucherman, 1999, p. 7).

So, it *can do something!*

Now, in which space should we stop to talk about this other body, a *corpoutro*? Well, it may be in an in-between, since it is that place that questions things, a place that opens the way to re-present the body through imagination, affection and love, not just through the rationalization of a subject supposedly enlightened by knowledge.

Finally, we open a space to launch other possibilities when (re) thinking with images, questioning them under the bias of a decolonial mathematical thought, that is, a thought that questions and reports the effects of truth and the hegemonic (mathematical) visualities: re-inventing itself to re-exist in Mathematics Education. A mathematics that allows us to see and say in different ways, a mathematics that is placed in other ways of representing the body through freedom of thought.

With the images of art, it is possible, perhaps, to exercise a denaturalization of mathematical thought. A thought that is taken as given and certain, true, precise and exact, from its problematization and the exercise of looking at other types of representations of the human body, at those marginalized visualities, seeking other smaller, marginal spaces, that escape the prescribed, the pre-established. This is a frontier thought that is biased by aesthetic disobedience and by the escape from hegemonic imprisonments. It is seeking other rationalities based on a re-existence, on other re-presentations of the body. It is listening to other voices, looking through other ways of looking. It is to find the survivals and resurgences of the bodies, the arts and the mathematics. Denaturalize gesture, speech, language and rationality.

In short, we can ask: how can Mathematics Education decolonize the imposed hegemonic discourse? Perhaps, with art, Mathematics Education can re-discover other ways of being in and experiencing the world. From this, it can enable the use of mathematics as a technique, a language that crosses thought and forms knowledge. Re-thinking it this way, questioning assumed truths and imposed consensus and, perhaps, giving way to a kind of decolonial mathematical thought.

AUTHOR'S STATEMENT OF CONTRIBUTIONS

M.M.K. developed activities, collected and analyzed data and structured the ideas for the article. C.R.F. supervised the project, conceived the idea of this article and analyzed data. The two authors discussed the results and contributed to the writing of the final version of the article.

DATA AVAILABILITY STATEMENT

The data supporting the results of this study are openly available at: https://repositorio.ufsc.br. These data were derived from the following resources available in the public domain: https://repositorio.ufsc.br/xmlui/handle/123456789/130964 and https://repositorio.ufsc.br/handle/123456789/191266 .

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